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Engineering Design File

IDAPA Air Compliance Demonstration for the ICDF Complex

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This document presents modeling results from WATER9 (emissions model) and Industrial Source Complex Model (ISC3) (short-term version 02035, ISCST3) (dispersion model) (EPA 1995a) to develop operational limits compliant with Idaho Administrative Procedures Act (IDAPA) 58.01.01 585 and 586 requirements for the toxic air pollutants. The system being modeled includes operations and maintenance of the INEEL CERCLA Disposal Facility landfill, evaporation pond with two cells, and treatment unit. This document will set the operational limits for the ICDF Complex.

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ABSTRACT

This document presents modeling results from WATER9 (emissions model) and Industrial Source Complex Model (ISC3) (short-term version 02035, ISCST3) (dispersion model) to develop operational limits compliant with Idaho Administrative Procedures Act 58.01.01 585 and 586 requirements for the toxic air pollutants. The system being modeled includes operations and maintenance of the INEEL CERCLA Disposal Facility landfill, evaporation pond with two cells, and treatment unit. This document will set the operational limits for the INEEL CERCLA Disposal Facility Complex.

CONTENTS

ACRONYMS

AAC	acceptable ambient concentration
AACC	acceptable ambient concentration for carcinogens
BFS	blast furnace slag
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DOE-ID	Department of Energy Idaho Operations Office
EDF	Engineering Design File
EL	emission level
EPA	Environmental Protection Agency
HEPA	high-efficiency particulate air
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
IDEQ	Idaho Department of Environmental Quality
ISC3	Industrial Source Complex
ISCST3	Industrial Source Complex, Short Term Model
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Environmental Engineering Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	land disposal restriction
NESHAP	National Emissions Standards for Hazardous Air Pollutants
OU	operable unit
PCB	polychlorinated biphenyls
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action

ROD	Record of Decision
SCRAM	Support Center for Regulatory Air Models
SSA	Staging and Storage Annex
TAP	toxic air pollutant
TSCA	Toxic Substances Control Act
TSP	total suspended particulates
TTN	Technology Transfer Network
USGS	U.S. Geological Survey
WAC	Waste Acceptance Criteria
WAG	waste area group

IDAPA Air Compliance Demonstration for the ICDF Complex

1. INTRODUCTION

The Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (ROD) (DOE-ID 1999). The OU 3-13 ROD requires the removal and on-Site disposal of some of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remediation wastes generated within the boundaries of the Idaho National Engineering and Environmental Laboratory (INEEL).

The INEEL CERCLA Disposal Facility (ICDF) Complex is an on-Site, engineered facility, located south of INTEC and adjacent to the existing percolation ponds. Designed and authorized to accept not only WAG 3 wastes, but also wastes from other INEEL CERCLA actions, the ICDF Complex will include the necessary subsystems and support facilities to provide a complete waste management system.

The major components of the ICDF Complex include the following:

- The disposal cells (ICDF landfill)
- The ICDF evaporation pond, consisting of two cells
- The ICDF Complex treatment unit.

The ICDF Complex, including a buffer zone, covers approximately 40 acres, with an ICDF landfill disposal capacity of approximately 510,000 yd^3. The ICDF landfill meets the substantive requirements of Resource Conservation and Recovery Act (RCRA) Subtitle C (42 USC 6921 et seq.), Idaho Hazardous Waste Management Act (HWMA 1983), DOE O 435.1, and Toxic Substances Control Act (TSCA) (15 USC 2601 et seq.) polychlorinated biphenyl (PCB) landfill design and construction requirements. The ICDF landfill is the consolidation point for CERCLA-generated wastes within the INEEL boundaries. The ICDF landfill will be able to receive CERCLA-generated wastes outside WAG 3 that meet the land disposal restriction (LDR) requirements as specified in the *Waste Acceptance Criteria for ICDF Landfill* and *Waste Acceptance Criteria for ICDF Evaporation Pond* (DOE-ID 2002a, 2002b). Waste generated within the WAG 3 area of contamination that has not triggered placement is not required to meet LDR criteria.

The ICDF evaporation pond, designated as a RCRA Corrective Action Management Unit (CAMU) in the OU 3-13 ROD, will be the disposal site for ICDF landfill leachate and other aqueous wastes generated as a result of operating the ICDF Complex. In addition, other aqueous wastes such as existing Group 4 and Group 5 purge water may be disposed in the ICDF evaporation pond in accordance with the evaporation pond Waste Acceptance Criteria (WAC).

The Staging and Storage Annex (SSA), located within the INTEC fenced area, serves as a temporary staging and storage area for INEEL CERCLA waste. The waste in the SSA will be designated for the following:

- Direct disposal to the ICDF landfill

- Direct disposal in the ICDF evaporation pond with two cells
- Staging, storage, or treatment in the ICDF Complex treatment unit
- Packaging in preparation for off-Site disposal
- Other INEEL on-Site disposal
- Off-Site disposal.

Wastes from WAG 3 and other CERCLA actions within the INEEL boundaries will be stored at the SSA during the design and construction of the ICDF Complex. Following construction, the operation of the SSA will be in accordance with the *INEEL CERCLA Disposal Facility Complex Remedial Action Work Plan* (DOE-ID 2003a). The ICDF Complex treatment unit will accept only low-level, mixed low-level, hazardous, and TSCA remediation wastes for disposal. Current projections of site-wide CERCLA waste volumes total about 510,000 yd^3. Most of the waste will be contaminated soil, but debris and CERCLA investigation-derived waste are also included in the waste inventory.

2. PURPOSE

The purpose for conducting the air emissions and dispersion modeling is to develop ICDF Complex operational limits that maximize operational flexibility and that meet Idaho Department of Environmental Quality (IDEQ) toxic air pollutant standards (IDAPA, 58.01.01.585 and 586). This document will set the operational limits for the ICDF Complex.

3. OPERATIONAL AIR EVALUATION DESIGN BASIS

The following is a summary of general assumptions and methodology regarding the design basis for conducting the Idaho Administrative Procedures Act (IDAPA) air evaluations to develop ICDF Complex operational limits.

3.1 Assumptions

The following list summarizes the general assumptions regarding the design basis for conducting the IDAPA air evaluations to develop ICDF Complex operational limits:

- The constituents to be evaluated consist only of those listed in both the "INEEL CERCLA Disposal Facility Design Inventory" (EDF-ER-264) and the IDAPA 58.01.01.585 and 586 tables. Design inventory constituents without tabled values will not be assessed in this effort.

- The receptor points for the 24-hour air concentration are along Highways 20 and 26 and annual ambient air concentrations are modeled at the point of compliance (i.e., site boundary). These points are established in accordance to IDEQ's *Air Quality Modeling Guidelines*—Draft (IDEQ 2002) and the internal IDEQ Memorandum dated March 15, 2002[a].

- The annual volume of soil considered in this evaluation consists of 36% of the total ICDF Complex capacity of 510,000 yd^3 as shown in the "Staging, Storage, Sizing, and Treatment Facility (SSSTF) SSSTF/ICDF Operational Scenario and Process Flows" (EDF-1547). This volume is consistent with the current National Emissions Standards for Hazardous Air Pollutants (NESHAP) evaluation conducted in "NESHAP Modeling for ICDF Complex" (EDF-ER-290).

- A fixed ratio has been developed to estimate the potential contributions from the ICDF landfill and the treatment unit, whereas the ICDF landfill and evaporation pond with two cells consider the full contaminant inventory based on 36% of the ICDF landfill capacity (EDF-1547). The ICDF Complex treatment unit fixed ratio contribution was conservatively assumed to be equivalent to 10% of the landfill emission rate, although the facility is expected to handle only 0.52% of the total waste.

3.2 Methodology

The following is a summary of general methodology regarding the design basis for conducting the IDAPA air evaluations to develop ICDF Complex operational limits:

1. Based on the first bullet above, a list of constituents to be evaluated (i.e., design constituents that are also listed in IDAPA 58.01.01.585 and 586 tables) was prepared. These constituents are included in Section 5, Table 5-1.

2. The models used to develop emission-based operating limits consist of WATER9 for modeling of emission rates for volatiles and semivolatiles, and ISCST3 for dispersion modeling of volatiles, semivolatiles, and nonvolatiles as particulates. The ISCST3 model provides the pollutant concentration at the facility boundary and along public roadways that bisect the facility. A detailed

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[a] Schilling, Kevin, IDEQ, internal IDEQ memorandum to Margaretha English, IDEQ, March 15, 2002, "Definition of Ambient Air and Dispersion Modeling Requirements."

discussion of the model-specific assumptions, methodology, and input parameters are included in Section 4.

3. The methodology/process for each model that was used to develop the concentration guidelines is presented in Sections 4.1 and 4.2. All input parameters for calculations and models are included in Sections 4.1.3 and 4.2.3.

4. Meteorological data from INTEC and 2 years (1994-1995) of ISC model-ready data processed with Salt Lake City upper air data was available and used in all modeling.

5. General Modeling Procedure: The initial allowable soil concentration used in the modeling was calculated for each constituent using Equation (1) from "IDAPA Air Compliance" (EDF-ER-315). Note that this equation was used to start the modeling iterations and has no bearing on the final results.

$$C_{Soil}\frac{mg}{kg} = \frac{\left(fEL\frac{lb}{hr} x365\frac{days}{year} x24\frac{hours}{day} \right)}{2.2E-06\frac{lb}{mg} xMASS\frac{kg}{year}} \qquad (1)$$

Where,

C_{Soil} = Soil Concentration (input to WATER9 model) (mg/kg)

f = factor applied to IDAPA 58.01.01.585 and 586 emission level (EL) values for iterative approach

EL = IDAPA 58.01.01.585 and 586 ELs (lb/hr)

MASS = total mass of soil evaluated is based on a maximum of 36% of the total volume of ICDF landfill during a given year (EDF-1547).

a. A starting factor (f) was used for the initial evaluation (i.e., 100%). This factor was adjusted upward or downward depending on results of modeling, until the maximum concentration guideline was obtained.

b. WATER9 model was run on volatile and semivolatile constituents to obtain emission rates. Then ISC3 was run on volatiles, semivolatiles, and particulates (nonvolatiles) to obtain the maximum air emission concentrations at the ambient air boundary (i.e., property line and Highways 20 and 26). The C_{Soil} value was used as the initial input concentration for both models.

c. The output was compared to tabled values (acceptable ambient concentration [AAC]/acceptable ambient concentration for carcinogens [AACC]) in IDAPA 58.01.01.585 and 586. The appropriate model was rerun with the new input according to Equation (2):

$$C_{soil,i} = (1/(AC_i/AACC)) * 95\% * C_{soil,i-1} \qquad (2)$$

Where:

$C_{soil,I}$ = Soil concentration input to WATER9 model (mg/kg)

AC_i = ISC modeled concentration, iteration *i* ($\mu g/m^3$)

AACC = IDAPA 58.01.01.586 or 585 standards, as applicable ($\mu g/m^3$)

$C_{soil,i-1}$ = Soil concentration input to WATER9 model, previous iteration (mg/kg).

d. If the modeled concentration was approximately 95% of the IDAPA tabled values, the modeling was complete. That concentration becomes the concentration guideline for the specified constituent. If the modeled concentration was above, or significantly below, the tabled values, the next step was performed.

e. For remaining constituents that were above or significantly below the IDAPA tabled values, the *f* value was adjusted upward or downward (to determine a new C_{Soil} value) by the percentage above or below the modeled values according to Equation (3):

$$C_{soil,i} = (1/(AC_i/AACC)) * 95\% * C_{soil,i-1} \tag{3}$$

Where:

$C_{soil,i}$ = Soil concentration input to WATER9 model (mg/kg)

AC_i ISC modeled concentration, iteration i ($\mu g/m^3$)

AACC = IDAPA 58.01.01.586 or 585 standards, as applicable ($\mu g/m^3$)

$C_{soil,i-1}$ = Soil concentration input to WATER9 model, previous iteration (mg/kg).

Steps c, d, and e were repeated until the modeled concentration for each constituent was approximately 95% (+ 2%) of the tabled value. Several iterations were required until a concentration guideline was developed for each constituent. A volatilization modeling flow chart is included as Figure 3-1.

6. Calculate daily and annual operational waste mass-based operating limits (kg/day) for each constituent based on the guideline concentrations determined through modeling.

7. A list of both 24-hour (IDAPA 585) and annual (IDAPA 586) standards as well as mass-based operating limits for each constituent was prepared and is included in Section 5, Table 5-1. The modeled concentration guideline concentrations, which were developed to maintain less than 95% of the IDAPA 58.01.01.585 and 586 standards, are considered to be within WAC guidelines for a given constituent if the modeled value was greater than the WAC guideline concentrations. Controls and tracking requirements for WAC limited constituents are included in the respective WAC guidelines (DOE-ID 2002a, 2002b). Modeled operational limits below WAC values indicate

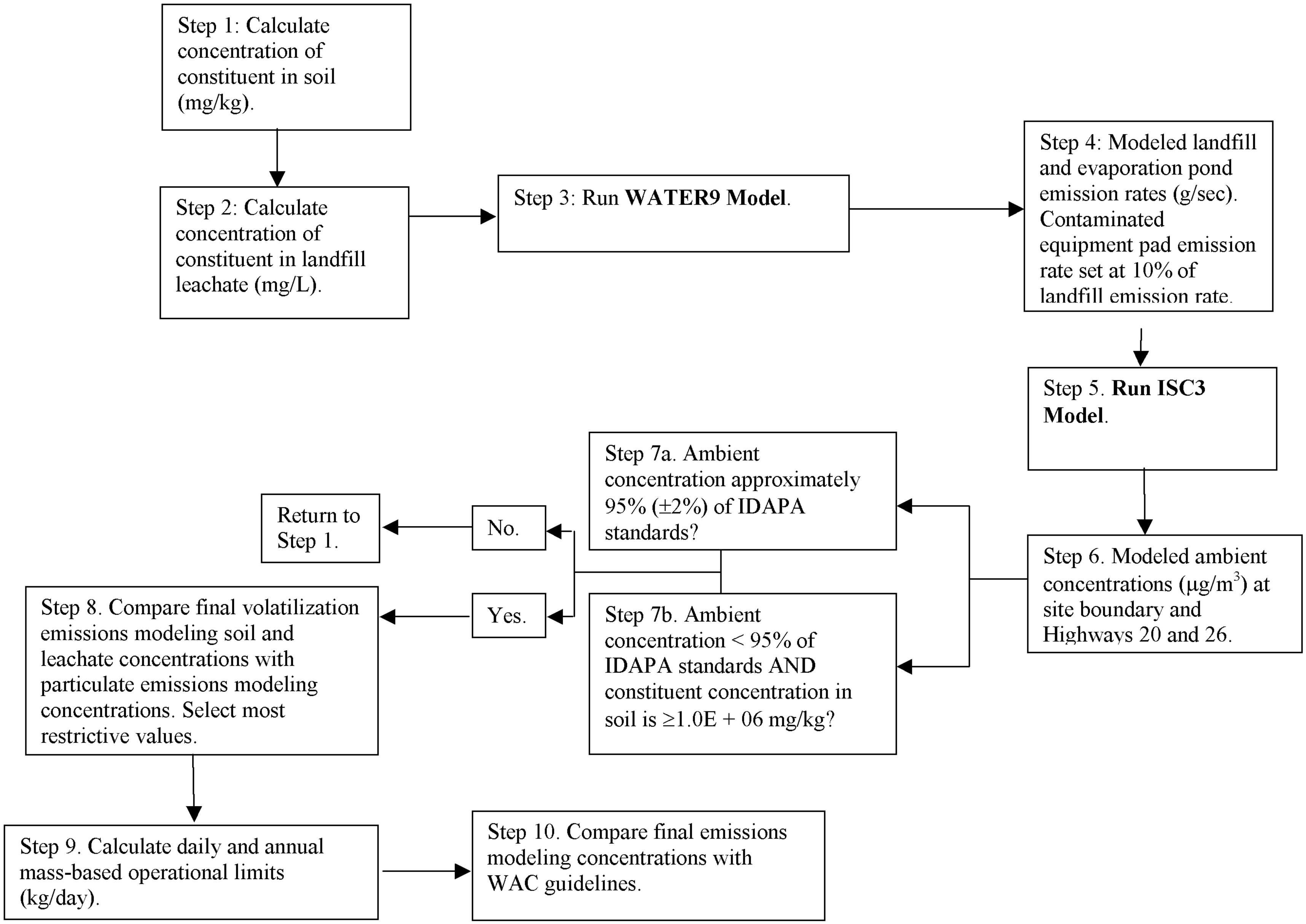

Figure 3-1. Volatilization modeling flow chart.

that additional waste tracking and/or operational controls will be required, in accordance with "Waste Tracking Plan for the INEEL CERCLA Disposal Facility Complex" (PLN-914). Operational controls may be required for benzidine, benzo(a)pyrene, hexachlorobenzene, hexachlorobutadiene, ethyl cyanide (as cyanide), hexachlorocyclopentadiene, mercury, and naphthalene, which are operationally limited for the landfill and/or evaporation pond based on a comparison of concentration guidelines to WAC guidelines. Operational controls will include, but are not limited to, storage or staging of waste, staggering of loads transported to the ICDF landfill over time, increased soil coverage for loads with operationally limited constituents, treatment of soils (e.g., grouting), and other types of controls evaluated on a case-by-case basis.

4. MODELING

The modeling was performed to determine emission rates of volatile and semivolatile toxic air pollutants from the ICDF Complex.

4.1 WATER9

4.1.1 Overview of Model

The purpose of the WATER9 model is to determine emission rates of volatile and semivolatile toxic air pollutants from the ICDF Complex. The WATER9 model incorporated emission estimation methods from an earlier spreadsheet-based model called CHEMDAT8. Previous versions of the WATER models emphasized calculation of emissions from wastewater treatment systems, whereas the CHEMDAT models addressed emissions from hazardous waste treatment and disposal facilities, including landfills and surface impoundments. The bases for the WATER9/CHEMDAT8 emission calculations are given in the "Air Emissions Models for Waste and Wastewater," Environmental Protection Agency (EPA)-453/R-94-080a (EPA 1994). WATER9 was obtained from EPA-listed preferred air models on the EPA's Technology Transfer Network (TTN), "Clearinghouse for Inventories and Emission Factors" (TTN 2002). Specific facility design and operating conditions are set as described in the following sections.

4.1.2 Assumptions and Methodology

The following general assumptions were made prior to initiation of modeling. These assumptions were reviewed and agreed to by the modelers, client, and regulators prior to performance of final modeling.

1. The ICDF Complex treatment unit was evaluated for having 2,660 yd^3 of waste in the facility at any one time based on the "Hazard Assessment Document" (INEEL 2002, Section 3.1.2.4.2).

2. The ICDF Complex will routinely place waste from April 1 to October 31. However, operation activities will continue throughout the year. Annual emissions were assumed to be continuous throughout the year using the average annual loading rate. The maximum 24-hour loading rate takes into account the seasonal operation of the ICDF landfill (as explained below).

3. A maximum of 36% (EDF-1547) (183,600 yd^3) of the total waste (510,000 yd^3) may be received in one year based on "Technical and Functional Requirements – WAG 3 INEEL CERCLA Disposal Facility and Evaporation Pond" (TFR-71, Section 1.7).

4. ICDF Complex operations are scheduled to be 10 hours per day, four days per week (TFR-71, Section 1.7). However, it is assumed the waste will remain uncovered in the intervening periods and that organic emissions will occur continuously (24 hours/day) until the ICDF landfill cover is installed.

5. It is assumed that the dust control agents will not impact volatilization of organic compounds.

6. Volatilization of contaminants is assumed to be the larger source of emissions; therefore, only volatile and semivolatile constituents were modeled using WATER9. Emissions of selected constituents expected to have relatively low volatility were estimated based on volatilization and particulate emissions or only particulate emissions.

7. Emissions from containerized waste are assumed to be relatively minimal for the ICDF Complex treatment unit and are accounted for as a percentage of the ICDF landfill emissions (10%).

8. All waste materials are assumed to have the same physical characteristics (i.e., equivalent to bulk soil) to provide a conservative estimate of organic emissions. Physical characteristics of contaminated debris (e.g., concrete, wood and personal protective equipment) are assumed to have higher density and lower levels of contamination, which would result in lower emission rates; therefore, these characteristics were not included in the modeling efforts.

9. Modeling was performed for emissions from active ICDF Complex operations only and used for comparison against the IDAPA 58.01.01.585 and 586 toxic air pollutant standards. Modeling of emissions from other facilities (such as INTEC) was not included in this evaluation.

10. Emissions calculations and modeling are for waste materials only, and do not include potential toxic air pollutant emissions from ICDF Complex treatment unit building combustion sources (e.g., building heaters and hot water boilers) and mobile sources (e.g., diesel heavy construction equipment).

11. Chemical fixation and stabilization will occur at the treatment unit and be achieved using the following materials: Portland cement Type I, blast furnace slag (BFS), Class F flyash, and sodium sulfide as shown in *Treatability Study Test Plan for Soil Stabilization* (DOE-ID 2003b). Emissions from additives used in the treatment area (e.g., portland cement and flyash) are not included in the WATER9 modeling, based on the insignificant volatile toxic emissions estimated from use of these materials. Furthermore, operational controls (e.g., high-efficiency particulate air [HEPA] filtration) will be in-place during operation of the treatment unit to significantly reduce particulate emissions from the treatment unit. However, the emissions from unloading and handling of these reagents outside the treatment area were calculated based on the treatment process being similar to the beginning part of a concrete batch plant (cement unloading to elevated storage silo and cement supplement unloading to elevated storage silo). Emissions for listed materials were estimated from factors for total particulates provided in "Compilation of Air Pollutant Emission Factors," Table 11.12-2 of the AP-42 (EPA 1995b).

12. 520 yd^3 of wastes in container holding pad; 40 roll-on/roll-off waste containers (INEEL 2002, Section 3.1.2.3). 400 yd^3 of wastes in truck parking and queuing area; 10 parked trucks, 10 waiting to unload with 20 yd^3 waste material each (INEEL 2002, Section 3.1.3.2). Note that the emissions from these sources are included in the ICDF Complex treatment unit as a percentage of the ICDF landfill emissions (see Number 7 above).

13. Annual volume of leachate is estimated at 540,096 liters/yr ("Leachate/Contamination Reduction Time" [EDF-ER-274, Table C-1]). Other aqueous wastes will be placed into the evaporation ponds (e.g., monitoring well purge water). Estimated volumes of these other aqueous wastes are not available.

14. Landfill soil/waste air porosity is total porosity (26.6%) minus the volumetric moisture content (11.7%) (EDF-ER-274, Table C-1). An equivalent moisture content of 7.8% by weight is used in the particulate emission calculations (Appendix A). It is assumed that the hydrocarbon percentage present is negligible.

Additional assumptions made during the performance of the modeling are listed below.

1. WATER9 required a waste loading rate for each waste stream in the units of liters per second. For the ICDF landfill the annual average daily loading rate (503 yd^3) was converted to liters per second. The model assumes the waste constituent concentrations are based on "the concentration in water." The flowrate was adjusted to represent an equivalent volume of water, that is a factor of 1.5 was applied to account for the difference in density between the soil and water. This assumption resulted in higher emission rates as shown in Equation (4).

$$\left(503\frac{yd^3}{day}\right)x\left(764.4\frac{L}{yd^3}\right)x\left(\frac{1}{86{,}400}\frac{day}{s}\right)x\left(1{,}500\frac{kg}{m^3}\right)x\left(\frac{1}{1{,}000}\frac{m^3}{kg}\right)=6.68\frac{L}{s} \quad (4)$$

2. ICDF evaporation pond constituent loading was calculated based on the methodology established in EDF-ER-274. The soil-water partitioning coefficient was used to calculate the amount of constituent released from the ICDF landfill to the evaporation pond.

3. Chemical constituents with very low or negligible volatility (e.g., heavy metals), based on WATER9 calculation of the air fraction release of less than 0.1%, were initially not modeled using WATER9 and ISCST3. Instead particulate emissions were calculated as shown in Appendix A. The resulting ambient particulate concentrations were then assumed to have a concentration equivalent to the contaminated soils. The exceptions are some organic constituents with a low volatility from the ICDF landfill, but high volatility from the ICDF evaporation pond, which were modeled as a particulate release and volatile release in order to determine the most limiting concentration. Furthermore, the remaining low-volatility organics (e.g., PCBs) were compared against constituents with comparable characteristics and/or limits (vapor pressure, AACC standards). Using only the WATER9 model as a check on this assumption, it was demonstrated that the WAC guideline concentrations would be several orders of magnitude lower than the modeled guideline concentrations.

4. Separate WATER9 model runs were performed for the ICDF landfill (as a land treatment unit) and the ICDF evaporation pond (as a lagoon).

5. The WATER9 model's automatic property estimation program was run to calculate missing chemical properties for selected compounds.

6. For constituents that were operationally limited for a single facility (based on a comparison of concentration guidelines to WAC guidelines), the input concentrations for the ICDF landfill and ICDF evaporation pond with two cells were adjusted and remodeled to balance the loadings between the facilities. This was done in order to eliminate operationally limited conditions where possible. Additional modeling may be performed to increase emission-based concentrations for the landfill and/or evaporation pond above the respective WAC guidelines.

   Where the constituent had emission-based concentration guidelines below the WAC-based guidelines for the evaporation pond (e.g., 1,1-Dichloroethene), the WAC guideline for the landfill was used as the initial basis for the load-balancing emissions model to demonstrate compliance with the IDAPA standards. In cases where no ICDF evaporation pond WAC guideline was specified (e.g., Hexachlorobutadiene), the ICDF landfill WAC guideline concentration was used as the initial set value for the load-balancing emission modeling, with the ICDF evaporation pond concentration guideline adjusted accordingly to meet the IDAPA standards.

4.1.3 Input Parameters

The following table contains input parameters used in the modeling.

Table 4-1. WATER9 model input parameters.

ICDF Complex Treatment Unit—Waste Loading	Input Values	Units	References
Maximum daily, maximum annual, and average daily loading	10% of the ICDF Landfill Loading Rates is the basis.		
ICDF Complex Treatment Unit—Parameters			
Emission rates	10% of ICDF Landfill Emission Rates		Conservative estimate given waste will be containerized and a small percentage of waste is to be treated in the ICDF Complex treatment unit (2,660 yd^3 of 510,000 yd^3 = 0.52%).
ICDF Landfill—Waste Loading			
Maximum daily loading	1,275	yd^3/day	Given 31 weeks of operations, 4 days/week (= 144 days) and 183,600 yd^3/yr, average maximum day = 1,275 yd^3/day.
Maximum annual loading	183,600	yd^3/yr	"IDAPA Air Compliance" (EDF-ER-315); *Geotechnical Report for the Conceptual Design of the INEEL CERCLA Disposal Facility at Waste Area Group 3, Operable Unit 3-13* (DOE-ID 2000).
Average daily loading (annual average)	503	yd^3/day	Based on 365 days/yr.
Constituents	See Table 5-1	NA	Waste constituents and initial concentrations come from "INEEL CERCLA Disposal Facility Design Inventory" (EDF-ER-264) and IDAPA 58.01.01.585 and 586.
ICDF Landfill Parameters			
Temperature soils	25	C	Default value.
Depth of waste layer	30.48	cm	Est. daily value—1 ft lifts "Waste Placement Plan" (EDF-ER-286).
	384	cm	Est. annual value based on depth of ICDF landfill at 36% of volume (17.7 ft) (EDF-1547). Total depth approx. 35 ft.
Air porosity	14.9	%	EDF-ER-274, Table C-1.
Total porosity	26.6	%	EDF-ER-274, Table C-1.
MWt of oil	282	g/gmol	Default value.
Operating time	1 365	day days	Short-term 24-hr value. Long-term annual value.
Active biomass	0	g/cc	Default value.
Loading	0.15	g oil/cc soil	Default value—10% oil content of waste; value based on assumed density of 1,500 kg/m^3.

Table 4-1. (continued).

ICDF Complex Treatment Unit—Waste Loading	Input Values	Units	References
Wind velocity	430	cm/s at 10 m	NOAA Climatic Data from Grid 3 Tower (NOAA 1989).
Area (at point of release)	32,992	m^2	Dwg. Sheet C-201 *INEEL CERCLA Disposal Facility Remedial Design/Construction Work Plan* (DOE 2002c); 776 ft by 457.8 ft.
Bulk density (loose)	1,500	kg/m^3	Design Inventory, EDF-ER-264, Table C-1.
Aqueous wastes	No		Assume no aqueous wastes.
Biodegradation	No		Assume no biodegradation in active ICDF landfill.
ICDF Evaporation Pond—Waste Loading			
Maximum daily loading			Only an annual average loading value used due to consistency of leachate concentrations and discharges to pond.
Maximum annual loading	540,096 142,690	liters/yr gal/yr	EDF-ER-274, Table C-1 (leachate).
Average daily loading (annual average)	391	gal/day	Based on 365 days/yr.
Constituents			Waste constituents and initial concentrations come from EDF-ER-264 and IDAPA 58.01.01.585 and 586.
ICDF Evaporation Pond (as a lagoon unit)			
Water temperature	25	C	Default value.
Length	125.3	m	Dwg. Sheet C-201 (DOE 2002c).
Width	105.3	m	Dwg. Sheet C-201 (DOE 2002c).
Depth	6.0 1.8	ft m	"Evaporation Pond Sizing with Water Balance and Make-up Water Calculations," EDF-ER-271.
Active biomass	0	g/l	Default value for nonbiological units.
Operating time	365	days	Assumes no discharge; only annual average concentration used.
Overall biorate	0	mg/g bio-hr	Default value.

The WATER9 input parameters included the concentration of toxic constituents in the wastes. The starting concentrations, C_{Max}, were based on the equation given in Section 3.

4.1.4 Performing the Model

The modeling methodology took two paths: one for volatile constituents and one for nonvolatile constituents. Modeling output is included in Appendix B.

The WATER9 model was run for the volatile constituents with the resulting modeled emission rates used as inputs to the ISC3 dispersion model. As described in the following section, the ISC3 modeled ambient air impacts, at the defined boundaries, were compared to the IDAPA toxic air pollutant standards (IDAPA 58.01.01). The toxic constituent concentrations in the incoming wastes were then adjusted and modeled in an iterative manner until the dispersion modeling results show the potential AAC for each toxic air pollutant (TAP) was approximately 95% (±2%) of the IDAPA acceptable ambient concentrations (IDAPA 58.01.01).

As a result of multiple sources (ICDF Complex: treatment unit, landfill, and evaporation pond with two cells) and the variable leachate concentrations, model run iterations were started by first adjusting the previous run's concentration guideline based on a comparison of the ISC3 modeling results to the IDAPA ambient air concentrations (AAC and AACC).

In each iteration, the concentration guideline value was used to calculate the concentration of the constituents in the ICDF landfill leachate. Equation (5) used is given below:

$$C_{H2O}\,\frac{mg}{L} = \frac{\left(C_{Max}\,\frac{mg}{kg} \times MASS\,\frac{kg}{yr}\right)}{\left(\left(Kd\,\frac{L}{kg} \times MASS\,\frac{kg}{year}\right) + V_{H2O}\right)} \tag{5}$$

Where,

C_{H2O} = Initial concentration of constituent in ICDF landfill leachate (mg/L)

C_{Max} = Maximum concentration (mg/kg)

MASS = total mass of soil evaluated is based on a maximum of 36% of the total volume of ICDF landfill during a given year (EDF-1547)

K_d = Partitioning Coefficient (L/kg)

V_{H2O} = Initial volume of water in ICDF landfill (L).

The calculated concentration was used as the input into WATER9 model for the ICDF evaporation pond. The initial leachate concentration was used since it represents the worse-case concentration.

Nonvolatile constituents (e.g., heavy metals) and low-volatility organics were evaluated as being released from the site as particulate emissions. The quantity of particulates released from the site during the unloading of contaminated soils, bulldozing of soils within the ICDF landfill, and windblown dust were calculated using EPA AP-42 (EPA 1995b) emission factors (Appendix A). Subsequently, since the ICDF landfill area is the major source of contaminated particulate emissions from the ICDF Complex facility, a unit emission rate was modeled using ISC3. Consequently, using the 24-hour and annual particulate emission rates, dispersion modeling results, and IDAPA 58.01.01.585 and 586 ambient air standards, the maximum allowable soil concentration (in mg/kg) was back calculated using Equation (6).

$$C_{Max} = \frac{95\,\% \times AACC\,\frac{\mu g}{m^3} \times 10^6\,\frac{mg}{kg}}{E_{PM}\,\frac{lb}{hr} \times 454\,\frac{g}{lb} \times \frac{hr}{3600\,s} \times F_{ISC}\,\frac{\mu g/m^3}{g/s}} \tag{6}$$

Where,

C_{Max} = Maximum concentration (mg/kg)

AACC = IDAPA 58.01.01.586 (μg/m^3). For noncarcinogens the AAC–IDAPA 58.01.01 585–was used in the equation

E_{PM} = Emission rate of particulate matter from facility (lb/hr)

F_{ISC} = ISC unit modeling factor (μg/m^3 per lb/hr). Annual and 24-hour average values are applied in the calculation for carcinogen and noncarcinogens constituents, respectively.

For organics with low volatility, defined for this exercise as a compound with a WATER9 calculated ICDF landfill air release fraction of less than 0.1%, the particulate analysis described previously was performed. However, some low-volatility organics with high volatilization rates from water (i.e., leachate and ICDF evaporation pond) were also modeled using the WATER9 model to determine which route of exposure was more limiting.

4.2 Industrial Source Complex Model (Short-term Version 02035, ISCST3)

4.2.1 Overview of Model

The EPA ISCST3 Model is an EPA-listed preferred air model and was used to calculate the downwind dispersion of constituents potentially emitted from the treatment facilities. The most current version of the model was used (Version 02035), as available on the EPA *Support Center for Regulatory Air Models* (SCRAM) web site (SCRAM 2002). ISCST3 is a steady-state Gaussian plume model that can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. This model can account for the following: settling and dry deposition of particles; downwash; point, area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment. ISC3 operates in both long-term and short-term modes.

4.2.2 Assumptions and Methodology

The following list summarizes the assumptions and methodology used for calculation of the downwind dispersion of constituents potentially emitted from the treatment facilities.

1. Modeling was performed for the emissions of air contaminants emitted from the ICDF Complex, which are subject to the Idaho TAP increments (IDAPA 58.01.01.585 and 586).

2. The EPA Industrial Source Complex model (ISCST3, Version 02035) was used to perform the dispersion modeling.

3. All modeling was performed according to guidance provided in the draft *State of Idaho Air Quality Modeling Guideline* (IDEQ 2002), the EPA *Guideline on Air Quality Modeling* (GAQM), (40 CFR 51, Appendix W), and the EPA "User's Guide for the Industrial Source Complex (ISCST3) Dispersion Models" (EPA 1995a).

4. The resulting modeled concentrations were compared to the regulatory AAC for noncarcinogens and for carcinogens AACC, as specified in the IDAPA 58.01.01.585 and 586. An iterative analysis was conducted to establish allowable waste concentrations.

5. Concentrations were calculated at receptors placed along the INEEL boundary and for the carcinogen TAPs with an annual average AACC, and the public highway that bisects the property, for the noncarcinogen TAPs AAC with a 24-hour average AAC. This is in accordance with IDEQ's *Air Quality Modeling Guidelines*—Draft (IDEQ 2002) and the internal IDEQ Memorandum.

6. Emissions for volatile and semivolatile constituents to be modeled were obtained from the WATER9 Model analysis. Nonvolatiles were modeled directly using the "User's Guide for the Industrial Source Complex (ISCST3) Dispersion Models" ISC3 (EPA 1995a).

4.2.3 Input Parameters

Three sources of emissions were evaluated in this analysis, all of which are characterized as area sources with no vertical momentum or buoyancy associated with the release. The following table provides a summary of the input data used in the model. Numerical inputs to the model are listed in the following table.

Table 4-2. ISCST3 model input parameters.

Model Input Data	Input Values	Units	References
Dispersion Inputs			
Averaging period	24-hour and annual	NA[a]	Based on the averaging period of the AAC (24 hour) and AACC (annual)
Actual receptor elevations	varies	Meters	USGS digital topographic data for the project site
Source Inputs			
ICDF Landfill Cell 1—Release height	2.7	Meters	Project drawing C-201, 05/14/2002 (based on berm height) (DWG-C-201, DOE 2002c)
ICDF Landfill Cell 1—Length of side in east-west direction	236.5	Meters	Same as above
ICDF Landfill Cell 1—Length of side in north-south direction	139.5	Meters	Same as above
ICDF Evaporation Ponds—Release height	2.4	Meters	Project drawing C-201, 05/14/2002 (based on berm height) (DWG-C-201, DOE 2002c)
ICDF Evaporation Ponds—Length of side in East-West direction	125.3	Meters	Same as above (two adjacent ponds modeled as one area source)
ICDF Evaporation Ponds—Length of side in north-south direction	105.3	Meters	Same as above (two adjacent ponds modeled as one area source)
ICDF Complex treatment unit (height and length of sides)	121.9 (east-west) × 137.2 (north-south) × 0.91 (height)	Meters	Based on horizontal dimensions of staging area

Table 4-2. (continued).

Model Input Data	Input Values	Units	References
Emissions estimates (all sources)	varies	Grams/ (sec-m^2)	WATER9 model output
Receptor Inputs			
Site boundary (incremental spacing along site boundary)	100	Meters	Boundary obtained from Applied Geosciences, as used for previous dispersion modeling analysis
Highway (incremental spacing along highway)	50	Meters	
Meteorological Inputs			
Meteorological Data	[a]	[a]	INTEC meteorological data and two years (1994-1995) of ISC model-ready data processed with Salt Lake City upper air data

a. Hourly values of wind speed (m/sec); wind direction (degrees), temperature (K), mixing height (m); vertical stability class (A-F).

4.2.4 Performing the Model

Pollutants were first categorized as volatile, emitted from the ICDF Complex, or nonvolatile, emitted only as a constituent of wind-blown dust from the ICDF landfill.

One model run was performed for the nonvolatile TAPs by modeling a unit (1 gram per second) emission rate from the ICDF landfill, and calculating a maximum 24-hour concentration (along Highways 20 and 26) and annual concentration (along the property boundary). These concentrations were then used to back calculate the TAP-specific allowable concentration in the soil for which the AAC or AACC would not be exceeded. All concentration guidelines and mass-based operating limits developed from this modeling are shown in Table 5-1.

For the volatile TAPs, the model was run separately for each TAP using initial emission estimates generated from the WATER9 runs for the ICDF landfill and evaporation pond with two cells. The ICDF landfill emission rate was multiplied by 0.10 to derive the ICDF Complex treatment unit emission rate. All concentration guidelines and mass-based operating limits developed from this modeling are shown in Table 5-1.

5. SUMMARY OPERATIONAL LIMITS

The following Table 5-1 is a summary of the final daily and annual operational waste mass limits (kg/day) for each constituent based on the guideline concentrations determined through modeling using WATER9 and ISC3. The complete list of modeling results (e.g., particulate-based concentrations, volatilization-based concentrations, and WAC guidelines) is included in Appendix C. These concentration guidelines were developed for both ICDF landfill soil and ICDF evaporation pond leachate.

The mass-based operating limits were calculated using the emission-based concentration guidelines and the loading rates for the landfill and evaporation pond. In some cases, the emission-based operational concentrations were below the WAC guidelines. Two limits are specified—24-hour maximum and annual average—to reflect the IDAPA air toxic regulations for noncarcinogens (24-hour standards) and carcinogens (annual standards), respectively.

The maximum 24-hour mass operational limits are the maximum amount of constituent that may be placed in the landfill in a 24-hour period. These values for the landfill are based on a maximum daily loading of 1,275 yd^3 per day and a bulk soil density of 1,500 kg/m^3 (see Table 4-1). The evaporation pond values are based on an annual average daily leachate rate of 391 gal/day. The ICDF Complex treatment unit emission rates are based on 10% of the landfill emission rates and use landfill waste constituent concentrations. The allowable concentrations would have a potential to be exceeded only in the unlikely event that the mass loading rates to the Complex are increased (see Table 4-1).

The annual mass operational limits are the maximum amount of constituent that may be placed in the landfill/evaporation pond on an annual average basis. Typically, the daily loadings will be tabulated on a monthly basis and then entered into a 12-month rolling average. These values for the landfill are based on an annual average loading of 503 yd^3 per day and a bulk soil density of 1,500 kg/m^3 (see Table 4-1). The evaporation pond values are based on an annual average daily leachate rate of 391 gal/day.

Table 5-1. Summary of final operational limits

		Guideline Concentrations		Mass-Based Operational Limits	
Compound	CAS No.	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (kg/day)[a]	Evaporation Pond (kg/day)[b]
Carcinogens (Annual Limit)					
1,1-Dichloroethene (vinylidene chloride)	75-35-4	8.57E + 01	3.85E + 02	4.94E + 01	5.70E - 01
1,1,2,2-Tetrachloroethane	79-34-5	3.89E + 02	1.51E + 03	2.24E + 02	2.23E + 00
1,1,2-Trichloroethane	79-00-5	1.10E + 03	4.43E + 03	6.32E + 02	6.55E + 00
1,1-Dichloroethane (ethylidenedichloride)	75-34-3	2.91E + 02	1.51E + 03	1.68E + 02	2.24E + 00
1,2-Dichloroethane	107-06-2	4.74E + 02	3.06E + 03	2.74E + 02	4.53E + 00
1,4-Dioxane	123-91-1	3.60E + 04	4.10E + 05	2.08E + 04	6.07E + 02
Acrylonitrile	107-13-1	3.45E + 02	5.55E + 03	1.99E + 02	8.22E + 00
Aramite	140-57-8	8.61E + 03	2.22E + 02	4.97E + 03	3.28E - 01
Arsenic	7440-38-2	2.59E + 04	NA	1.49E + 04	NA
Benzene	71-43-2	8.70E + 02	4.05E + 03	5.02E + 02	5.99E + 00
Benzidine	92-87-5	1.72E + 01	3.88E + 03	9.92E + 00	5.74E + 00

Table 5-1. (continued).

Compound	CAS No.	Guideline Concentrations		Mass-Based Operational Limits	
		Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (kg/day)[a]	Evaporation Pond (kg/day)[b]
Benzo(a)pyrene	50-32-8	1.05E + 02	3.11E + 02	6.06E + 01	4.60E - 01
Beryllium	440-41-7	4.73E + 05	NA	2.73E + 05	NA
bis(2-Chloroethyl)ether	111-44-4	7.09E + 02	2.84E + 03	4.09E + 02	4.20E + 00
bis(2-Chloroisopropyl)ether	108-60-1	2.26E + 03	1.06E + 04	1.31E + 03	1.57E + 01
bis(2-Ethylhexyl)phthalate	117-81-7	1.00E + 06	2.65E + 01	5.77E + 05	3.92E - 02
Cadmium	7440-43-9	6.30E + 04	NA	3.64E + 04	NA
Chloromethane (methylchloride)	74-87-3	1.42E + 03	9.63E + 03	8.21E + 02	1.42E + 01
Hexachlorobenzene[c]	118-74-1	8.25E + 00	6.00E - 02	4.76E + 00	8.88E - 05
Hexachlorobutadiene	87-68-3	2.07E + 01	4.86E + 04	1.19E + 01	7.19E + 01
Hexachloroethane	67-72-1	9.12E + 03	2.02E + 03	5.26E + 03	2.99E + 00
Methylene Chloride (dichloromethane)	75-09-2	2.09E + 03	2.46E + 04	1.21E + 03	3.64E + 01
Nickel	7440-02-0	4.73E + 05	NA	2.73E + 05	NA
PCB Aroclor 1016 (monochlorobiphenyl)	NA	1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1254 (pentachlorobiphenyl)	NA	1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1260 (hexachlorobiphenyl)	NA	1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1268	NA	1.00E + 06	NA	5.77E + 05	NA
Tetrachloroethene	127-18-4	1.19E + 04	1.65E + 04	6.86E + 03	2.43E + 01
Trichlorophenol 2,4,6	88-06-2	1.69E + 05	1.67E + 05	9.77E + 04	2.47E + 02
Noncarcinogens (Annual Limit)					
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
1,2,4-Trichlorobenzene	120-82-1	1.52E + 05	3.60E + 04	8.75E + 04	5.33E + 01
1,2-Dichlorobenzene (-o)	95-50-1	8.15E + 05	8.09E + 05	4.70E + 05	1.20E + 03
1,2-Dichloroethene (total)	540-59-0	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
1,4-Dichlorobenzene (-p)	106-46-7	9.73E + 05	6.08E + 05	5.62E + 05	9.00E + 02
2-Butanone (methyl ethyl ketone, MEK)	78-93-3	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
2-Hexanone (methyl n-butyl ketone)	591-78-6	1.88E + 05	1.00E + 06	1.08E + 05	1.48E + 03
4,6 Dinitro-o-Cresol	534-52-1	1.00E + 06	NA	5.77E + 05	NA
4-Methyl-2-Pentanone (MIBK)	108-10-1	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Acetone (propanone)	67-64-1	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Acetonitrile	75-05-8	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Acrolein (propenal)	107-02-8	1.62E + 03	1.43E + 04	9.36E + 02	2.12E + 01
Aluminum	7429-90-5	1.00E + 06	NA	5.77E + 05	NA
Antimony	7440-36-0	1.00E + 06	NA	5.77E + 05	NA
Barium	7440-39-3	1.00E + 06	NA	5.77E + 05	NA

Table 5-1. (continued).

Compound	CAS No.	Guideline Concentrations: Landfill (mg/kg)	Guideline Concentrations: Evaporation Pond (mg/L)	Mass-Based Operational Limits: Landfill (kg/day)[a]	Mass-Based Operational Limits: Evaporation Pond (kg/day)[b]
Calcium (as calcium carbonate)	13765-19-0	1.00E + 06	NA	5.77E + 05	NA
Carbon Disulfide	75-15-0	3.02E + 04	1.73E + 05	1.74E + 04	2.57E + 02
Chlorobenzene	108-90-7	6.81E + 05	1.00E + 06	3.93E + 05	1.48E + 03
Chloroethane (ethyl chloride)	75-00-3	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Chloromethane (methylchloride)	74-87-3	1.09E + 05	9.63E + 03	6.31E + 04	1.42E + 01
Chlorophenol-2	95-57-8	1.00E + 06	NA	5.77E + 05	NA
Chromium (total)	7440-47-3	1.00E + 06	NA	5.77E + 05	NA
Cobalt	7440-48-4	1.00E + 06	NA	5.77E + 05	NA
Copper	7440-50-8	1.00E + 06	NA	5.77E + 05	NA
Cresol -o (2-methylphenol)	95-48-7	1.00E + 06	NA	5.77E + 05	NA
Cresol -p (4-methylphenol)	106-44-5	1.00E + 06	NA	5.77E + 05	NA
Cyclonite (RDX)	121-82-4	1.00E + 06	NA	5.77E + 05	NA
Diacetone alcohol	123-42-2	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Dibutylphthalate	84-74-2	1.00E + 06	1.18E + 04	5.77E + 05	1.75E + 01
Diethylphthalate	84-66-2	1.09E + 04	1.40E + 04	6.27E + 03	2.07E + 01
Dimethylphthalate	131-11-3	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Di-n-octylphthalate	117-84-0	7.98E + 03	3.84E - 02	4.60E + 03	5.68E - 05
Ethyl cyanide (as Cn - cyanide)[c]	592-01-8	4.14E + 03	6.90E + 04	2.39E + 03	1.02E + 02
Ethylbenzene	100-41-4	6.18E + 05	1.00E + 06	3.56E + 05	1.48E + 03
Fluorides (as F)	7782-41-4	1.00E + 06	NA	5.77E + 05	NA
Hexachlorocyclopentadiene	77-47-4	1.14E + 01	2.15E + 04	6.58E + 00	3.18E + 01
Iron (as iron salts, soluable)	7439-89-6	1.00E + 06	NA	5.77E + 05	NA
Isobutyl Alcohol (isobutanol; 2-methyl 1-propanol)	78-83-1	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Isophorone	78-59-1	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Isopropyl Alcohol (2-propanol; isopropanol)	67-63-0	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Manganese	7439-96-5	1.00E + 06	NA	5.77E + 05	NA
Mercury[c]	7439-97-6	1.28E + 02	6.75E + 02	7.40E + 01	9.99E - 01
Mesityl Oxide	141-79-7	1.00E + 06	NA	5.77E + 05	NA
Methyl Acetate (methyl ethanoate)	79-20-9	1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Molybdenum (as Mo soluable compounds)	7439-98-7	1.00E + 06	NA	5.77E + 05	NA
Naphthalene	91-20-3	4.25E + 02	1.00E + 06	2.45E + 02	1.48E + 03
Nitric Acid	7697-37-2	1.00E + 06	NA	5.77E + 05	NA
Nitroaniline P	100-01-6	1.00E + 06	NA	5.77E + 05	NA

Table 5-1. (continued).

Compound	CAS No.	Guideline Concentrations		Mass-Based Operational Limits	
		Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (kg/day)[a]	Evaporation Pond (kg/day)[b]
Nitrobenzene	98-95-3	8.26E + 04	3.73E + 05	4.76E + 04	5.52E + 02
Pentachlorophenol	87-86-5	6.64E + 03	4.31E + 03	3.83E + 03	6.38E + 00
Phenol	108-95-2	2.13E + 04	1.61E + 05	1.23E + 04	2.39E + 02
Phosphorus	7723-14-0	1.00E + 06	NA	5.77E + 05	NA
Potassium (as potassium hydroxide)	1310-58-3	1.00E + 06	NA	5.77E + 05	NA
Selenium	7782-49-2	1.00E + 06	NA	5.77E + 05	NA
Silver	7440-22-4	1.00E + 06	NA	5.77E + 05	NA
Sodium (as sodium hydroxide)	1310-73-2	1.00E + 06	NA	5.77E + 05	NA
Styrene (ethenylbenzene)	100-42-5	4.55E + 04	1.94E + 04	2.62E + 04	2.88E + 01
Sulfuric Acid (as sulfate)	7664-93-9	1.00E + 06	NA	5.77E + 05	NA
Sulfuric Acid (as sulfide)	7664-93-9	1.00E + 06	NA	5.77E + 05	NA
Thallium	7440-28-0	1.00E + 06	NA	5.77E + 05	NA
Toluene	108-88-3	5.34E + 05	1.00E + 06	3.08E + 05	1.48E + 03
Tributylphosphate	126-73-8	1.00E + 06	NA	5.77E + 05	NA
Trichloroethene	79-01-6	3.42E + 05	1.00E + 06	1.97E + 05	1.48E + 03
Vanadium	1314-62-1	1.00E + 06	NA	5.77E + 05	NA
Xylene (total)	1330-20-7	6.53E + 05	1.00E + 06	3.77E + 05	1.48E + 03
Zinc	7440-66-6	1.00E + 06	NA	5.77E + 05	NA
Zirconium (as Zr compounds)	7440-67-7	1.00E + 06	NA	5.77E + 05	NA
Noncarcinogens (24-Hour Maximum Limit)					
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
1,2,4-Trichlorobenzene	120-82-1	9.15E + 04	2.18E + 04	1.34E + 05	3.22E + 01
1,2-Dichlorobenzene (-o)	95-50-1	4.91E + 05	4.87E + 05	7.18E + 05	7.21E + 02
1,2-Dichloroethene (total)	540-59-0	6.36E + 05	1.00E + 06	9.30E + 05	1.48E + 03
1,4-Dichlorobenzene (-p)	106-46-7	5.86E + 05	3.66E + 05	8.56E + 05	5.42E + 02
2-Butanone (methyl ethyl ketone, MEK)	78-93-3	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
2-Hexanone (methyl n-butyl ketone)	591-78-6	1.13E + 05	1.00E + 06	1.66E + 05	1.48E + 03
4,6 Dinitro-o-Cresol	534-52-1	1.00E + 06	NA	1.46E + 06	NA
4-Methyl-2-Pentanone (MIBK)	108-10-1	6.36E + 05	1.00E + 06	9.29E + 05	1.48E + 03
Acetone (propanone)	67-64-1	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Acetonitrile	75-05-8	7.54E + 05	1.00E + 06	1.10E + 06	1.48E + 03
Acrolein (propenal)	107-02-8	1.06E + 03	9.36E + 03	1.55E + 03	1.39E + 01
Aluminum	7429-90-5	1.00E + 06	NA	1.46E + 06	NA
Antimony	7440-36-0	1.00E + 06	NA	1.46E + 06	NA

Table 5-1. (continued).

Compound	CAS No.	Guideline Concentrations: Landfill (mg/kg)	Guideline Concentrations: Evaporation Pond (mg/L)	Mass-Based Operational Limits: Landfill (kg/day)[a]	Mass-Based Operational Limits: Evaporation Pond (kg/day)[b]
Barium	7440-39-3	1.00E + 06	NA	1.46E + 06	NA
Calcium (as calcium carbonate)	13765-19-0	1.00E + 06	NA	1.46E + 06	NA
Carbon Disulfide	75-15-0	1.80E + 04	1.03E + 05	2.63E + 04	1.53E + 02
Chlorobenzene	108-90-7	4.07E + 05	6.57E + 05	5.95E + 05	9.72E + 02
Chloroethane (ethyl chloride)	75-00-3	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Chloromethane (methylchloride)	74-87-3	6.67E + 04	4.52E + 05	9.75E + 04	6.69E + 02
Chlorophenol-2	95-57-8	1.00E + 06	NA	1.46E + 06	NA
Chromium (total)	7440-47-3	1.00E + 06	NA	1.46E + 06	NA
Cobalt	7440-48-4	1.00E + 06	NA	1.46E + 06	NA
Copper	7440-50-8	1.00E + 06	NA	1.46E + 06	NA
Cresol -o (2-methylphenol)	95-48-7	1.00E + 06	NA	1.46E + 06	NA
Cresol -p (4-methylphenol)	106-44-5	1.00E + 06	NA	1.46E + 06	NA
Cyclonite (RDX)	121-82-4	1.00E + 06	NA	1.46E + 06	NA
Diacetone alcohol	123-42-2	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Dibutylphthalate	84-74-2	3.11E + 05	3.67E + 03	4.55E + 05	5.43E + 00
Diethylphthalate	84-66-2	6.52E + 03	8.36E + 03	9.53E + 03	1.24E + 01
Dimethylphthalate	131-11-3	1.93E + 05	8.31E + 05	2.82E + 05	1.23E + 03
Di-n-octylphthalate	117-84-0	4.76E + 03	2.29E - 02	6.96E + 03	3.39E - 05
Ethyl cyanide (as Cn - cyanide)[c]	592-01-8	2.50E + 03	4.17E + 04	3.66E + 03	6.17E + 01
Ethylbenzene	100-41-4	3.70E + 05	6.50E + 05	5.42E + 05	9.62E + 02
Fluorides (as F)	7782-41-4	1.00E + 06	NA	1.46E + 06	NA
Hexachlorocyclopentadiene	77-47-4	<u>3.42E + 02</u>	<u>6.84E - 01</u>	5.00E + 02	1.01E - 03
Iron (as iron salts, soluable)	7439-89-6	1.00E + 06	NA	1.46E + 06	NA
Isobutyl Alcohol (isobutanol; 2-methyl 1-propanol)	78-83-1	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Isophorone	78-59-1	7.99E + 05	1.00E + 06	1.17E + 06	1.48E + 03
Isopropyl Alcohol (2-propanol; isopropanol)	67-63-0	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Manganese	7439-96-5	1.00E + 06	NA	1.46E + 06	NA
Mercury[c]	7439-97-6	7.74E + 01	4.07E + 02	1.13E + 02	6.02E - 01
Mesityl Oxide	141-79-7	1.00E + 06	NA	1.46E + 06	NA
Methyl Acetate (methyl ethanoate)	79-20-9	1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Molybdenum (as Mo soluable compounds)	7439-98-7	1.00E + 06	NA	1.46E + 06	NA
Naphthalene	91-20-3	<u>1.10E + 05</u>	<u>2.17E + 04</u>	1.61E + 05	3.21E + 01
Nitric Acid	7697-37-2	1.00E + 06	NA	1.46E + 06	NA

Table 5-1. (continued).

		Guideline Concentrations		Mass-Based Operational Limits	
Compound	CAS No.	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (kg/day)[a]	Evaporation Pond (kg/day)[b]
Nitroaniline P	100-01-6	1.00E + 06	NA	1.46E + 06	NA
Nitrobenzene	98-95-3	5.54E + 04	2.50E + 05	8.10E + 04	3.70E + 02
Pentachlorophenol	87-86-5	4.01E + 03	2.60E + 03	5.86E + 03	3.85E + 00
Phenol	108-95-2	1.28E + 04	9.69E + 04	1.87E + 04	1.43E + 02
Phosphorus	7723-14-0	1.00E + 06	NA	1.46E + 06	NA
Potassium (as potassium hydroxide)	1310-58-3	1.00E + 06	NA	1.46E + 06	NA
Selenium	7782-49-2	1.00E + 06	NA	1.46E + 06	NA
Silver	7440-22-4	1.00E + 06	NA	1.46E + 06	NA
Sodium (as sodium hydroxide)	1310-73-2	1.00E + 06	NA	1.46E + 06	NA
Styrene (ethenylbenzene)	100-42-5	2.74E + 04	1.17E + 04	4.01E + 04	1.73E + 01
Sulfuric Acid (as sulfate)	7664-93-9	1.00E + 06	NA	1.46E + 06	NA
Sulfuric Acid (as sulfide)	7664-93-9	1.00E + 06	NA	1.46E + 06	NA
Thallium	7440-28-0	1.00E + 06	NA	1.46E + 06	NA
Toluene	108-88-3	3.21E + 05	7.82E + 05	4.69E + 05	1.16E + 03
Tributylphosphate	126-73-8	1.00E + 06	NA	1.46E + 06	NA
Trichloroethene	79-01-6	2.03E + 05	6.85E + 05	2.96E + 05	1.01E + 03
Vanadium	1314-62-1	1.00E + 06	NA	1.46E + 06	NA
Xylene (total)	1330-20-7	3.92E + 05	7.12E + 05	5.73E + 05	1.05E + 03
Zinc	7440-66-6	1.00E + 06	NA	1.46E + 06	NA
Zirconium (as Zr compounds)	7440-67-7	1.00E + 06	NA	1.46E + 06	NA

a These values were calculated using the annual concentration guidelines (mg/kg) × (1,500 kg/m^3) × (503 yd^3/day) × (0.7646 m^3/yd^3)/(1E + 06 mg/kg).

b Mass-based operational limits are based on an annual average daily leachate rate of 391 gal/day. These concentrations were calculated using the annual concentration guidelines (mg/L) × (391 gal/day) × (3.785 L/gal)/(1E + 06 mg/kg)

c These constituents were operationally controlled for either the landfill or for both facilities; therefore, additional modeling was not performed. These constituents were operationally limited based on a comparison of concentration guidelines to WAC guidelines.

Italicized values were categorized as very low or nonvolatile constituents. Only a particulate modeling analysis was performed.

Shaded values have evaporation pond concentrations below the WAC guideline concentrations. Subsequent modeling has shown that following WAC guidelines for both the landfill and evaporation pond with two cells will keep emissions within the IDAPA standards.

Underlined values have the landfill concentrations set at the WAC guideline concentrations. The evaporation pond concentrations have been maximized but are still below WAC guideline concentrations.

NA indicates that no emissions from water were modeled due to low volatility and no WAC limits have been set.

Table 5-2 lists the constituents that have emission-based guideline concentrations below the WAC guideline concentrations. The balance of the constituents shown in Table 5-1 have emission-based guideline concentrations above the WAC guideline concentrations.

Table 5-2. Summary of IDAPA emission-based operational limits.

	WAC Guideline Concentrations		Guideline Concentrations		Mass-Based Operational Limits	
Compound	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill (kg/day)	Evaporation Pond (kg/day)
Carcinogens (Annual Limit)						
1,1-Dichloroethene (vinylidene chloride)	1.48E + 00	5.00E + 02	8.57E + 01	3.5E + 02	4.94E + 01	5.70E - 01
Aramite	6.71E + 00	1.00E + 04	8.61E + 03	2.22E + 02	4.97E + 03	3.28E - 01
Benzidine	1.72E + 01	1.00E + 04	1.72E + 01	3.88E + 03	9.92E + 00	5.74E + 00
Benzo(a)pyrene	1.05E + 02	2.00E + 03	1.05E + 02	3.11E + 02	6.06E + 01	4.60E - 01
bis(2-Ethylhexyl)phthalate	1.47E + 02	2.00E + 03	1.00E + 06	2.65E + 01	5.77E + 05	3.92E - 02
Hexachlorobenzene	1.14E + 01	No limit	8.25E + 00	6.00E - 02	4.76E + 00	8.88E - 05
Hexachlorobutadiene	2.07E + 01	No limit	2.07E + 01	4.86E + 04	1.19E + 01	7.19E + 01
Noncarcinogens (Annual Limit)						
Di-n-octylphthalate	2.62E + 01	1.00E + 04	7.98E + 03	3.84E - 02	4.60E + 03	5.68E - 05
Ethyl cyanide (as Cn - cyanide)	3.31E + 04	1.00E + 04	4.14E + 03	6.90E + 04	2.39E + 03	1.02E + 02
Hexachlorocyclopentadiene	1.14E + 01	No limit	1.14E + 01	2.15E + 04	6.58E + 00	3.18E + 01
Mercury	9.45E + 03	5.00E + 05	1.28E + 02	6.75E + 02	7.40E + 01	9.99E - 01
Naphthalene	4.25E + 02	No limit	4.25E + 02	1.00E + 06	2.45E + 02	1.48E + 03
Pentachlorophenol	5.59E + 01	1.00E + 04	6.64E + 03	4.31E + 03	3.83E + 03	6.38E + 00
Noncarcinogens (24-Hour Maximum Limit)						
Dibutylphthalate	2.39E + 01	1.00E + 04	3.11E + 05	3.67E + 03	4.55E + 05	5.43E + 00
Diethylphthalate	1.14E + 01	1.00E + 04	6.52E + 03	8.36E + 03	9.53E + 03	1.24E + 01
Di-n-octylphthalate	2.62E + 01	1.00E + 04	4.76E + 03	2.29E - 02	6.96E + 03	3.39E - 05
Ethyl cyanide (as Cn - cyanide)	3.31E + 04	1.00E + 04	2.50E + 03	4.17E + 04	3.66E + 03	6.17E + 01
Hexachlorocyclopentadiene	1.14E + 01	No limit	3.42E + 02	6.84E - 01	5.00E + 02	1.01E - 03
Mercury	9.45E + 03	5.00E + 05	7.74E + 01	4.07E + 02	1.13E + 02	6.02E - 01
Naphthalene	4.25E + 02	No limit	1.10E + 05	2.17E + 04	1.61E + 05	3.21E + 01
Pentachlorophenol	5.59E + 01	1.00E + 04	4.01E + 03	2.60E + 03	5.86E + 03	3.85E + 00

Shaded values have evaporation pond concentrations below the WAC guideline concentrations. Subsequent modeling has shown that following WAC guidelines for both the landfill and evaporation pond with two cells will keep emissions within the IDAPA standards.

Underlined values have the landfill concentrations set at the WAC guideline concentrations. The evaporation pond concentrations have been maximized but are still below WAC guideline concentrations. Additional modeling may be performed to adjust landfill and evaporation pond concentrations including setting the evaporation pond at WAC guidelines and maximizing landfill concentrations.

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Appendix A

Particulate Emissions Calculations

Appendix A
Particulate Emissions Calculations

This appendix provides the assumptions and calculations for particulate emissions (total suspended particulates [TSP] and particulate matter) calculations from the ICDF landfill operations. The landfill was evaluated, since it is the major source of TSP. The calculated TSP emissions from the landfill operations are less than 2.5 tons per year. To be subject to a prevention of significant deterioration permit under 40 CFR 52.21, particulate emission rates would have to exceed 25 tons per year, total, or 15 tons per year, PM10. Therefore, particulate emissions are not further considered.

The operations evaluated were the actual unloading of containers into the landfill, the activity of spreading the soil, and consideration of wind-blown dust. Also evaluated were the TSP emissions from the chemical reagents used in the ICDF Complex treatment unit waste treatment process (e.g., Portland cement and flyash).

A.1 Unloading Containers

The assumptions regarding unloading the containers are as follows:

- Landfill operates April 1 through October 31, 10 hrs/day, 4 days/week (TFR-71, Section 1.7).
- Landfill receives 36% (EDF-1547) of total capacity of 510,000 yd^3/yr (183,600 yd^3/yr) (TFR-71, Section 1.7).
- Density of soil is 1,500 kg/m^3 (2,527 lb/yd^3) (EDF-ER-264, Table C-1).
- Moisture Content is 11.7% (EDF-ER-274, Table C-1, difference between Total Porosity of 26.6% and Air Porosity of 14.9%). An equivalent moisture content of 7.8% by weight is used in the particulate emission calculations in Appendix A.
- Average wind speed is 4.3 m/s (9.6 mph). Two years [1994-1995] of data processed with Salt Lake City upper air data for the INEEL site and used in *Application to Construct an Air Pollution Emitting Facility: The Advanced Mixed Waste Treatment Facility* (IDEQ 2001).

Use Equation (A-1) (from AP-42, Section 13.2.4.3 [EPA 1995b])

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad \text{(A-1)}$$

Where:

E = emission factor, lb TSP/ton of waste

k = particle size multiplier (dimensionless). For aerodynamic particle size <30 um, k=0.74 (EPA 1995b, Section 13.2.4.3)

U = mean wind speed, miles per hour (mph). Mean wind speed for the period April 1 through October 31 is 9.6 mph

M = material moisture content.

Converting moisture content to weight basis gives:

$$M = \frac{(0.117\, cm^3\ moisture)(1\, g / cm^3)}{1.5\, g\ soil / cm^3\ soil} = 0.078\ or\ 7.8\%(w/w)$$

Substituting values into equation 1 yields

$$E = 0.74(0.0032)\frac{\left(\frac{9.6}{5}\right)^{1.3}}{\left(\frac{7.8}{2}\right)^{1.4}} = 8.23 \times 10^{-4}\, lb\ TSP / ton\ of\ waste$$

The annual receipts of soil in the landfill are

$$\text{Re}ceipts = (183{,}600\, yd^3 / yr)(2{,}527\ lb / yd^3)(1\ ton / 2{,}000\ lb) = 2.32 \times 10^5\ tons\ of\ waste$$

So the annual emissions due to dumping would be

$(8.23 \times 10^{-4}$ lb TSP/ton of waste)$(2.32 \times 10^{5}$ tons of waste)(1 ton/2,000 lb)
= 0.095 ton TSP/year, which is 190 lb TSP/year.

The landfill will operate 31 weeks/year, 4 days/week, so the daily emission rate is

(0.095 ton TSP/year)(1 year/31 weeks)(1 week/4 days)
= 7.68×10^{-4} ton TSP/day, which is 0.87 lb TSP/day

and the hourly emission rate (24-hour average) is

$(7.68 \times 10^{-4}$ ton TSP/day)(1 day/24 hour)
= 3.20×10^{-5} ton TSP/hr, which is 0.064 lb/hr (24-hour average)

A.2 Landfill Operations

The assumptions regarding landfill operations are as follows:

- Landfill operates April 1 through October 31, 10 hrs/day, 4 days/week (TFR-71, Section 1.7).
- Landfill dimensions of one cell are 776 ft × 457.8 ft (ICDF Dwg. Sheet C-201, DOE 2002c).
- Water used as dust suppressant on half the area of the cell 1 during operations, April 1 through October 31 (TFR-71, Section 2.3).

- Crusting agent as dust suppressant on half the area during operations, April 1 through October 31 (TFR-71, Section 2.3).

- Crusting agent as dust suppressant on entire area November 1 through March 31 (TFR-71, Section 2.3).

- Control efficiency of crusting agent, 90% for chemical wetting agents for control of wind erosion (EPA 1992).

- Control efficiency of water, 50% (EPA 1992).

The emission factor for the bulldozer operation is taken from Table 11.9-1 (EPA 1995b) for bulldozing of overburden. See Equation (A-2):

$$E = \frac{5.7\,(s)^{1.2}}{(M)^{1.3}} \tag{A-2}$$

Where

E = emission factor, lb TSP/hr

s = material silt content (%), assumed to be 7%

M = material moisture content [7.8% (w/w)]

The emission rate is then

$$E = \frac{5.7\,(7)^{1.2}}{(7.8)^{1.3}} = 4.08\ lb\ TSP/hr$$

Assuming the bulldozer operates 40 hr/week, 31 weeks/year, and assuming that water is used as a dust suppressant, the annual emission rate is

(4.08 lb/hr)(40 hr/wk)(31 wk/yr)(1-0.5)(1 ton/2,000 lb)
= 1.26 tons TSP/yr which is 2,530 lb TSP/yr.

The 24-hour average is

(4.08 lb TSP/hr)(10 hr/day)(1 day/24 hr)(1-0.5)(1 ton/2,000 lb)
= 4.3×10^{-4} ton TSP/hr which is 0.85 lb TSP/hr.

Wind erosion of exposed areas is 0.38 ton/acre/yr, taken from Table 11.9-4 (EPA 1995b)

Assume half of the landfill has a crusting agent applied and the other half has no controls for 7 months of the year, and that crusting agent is used on the entire landfill the remainder of the year.

Emission factor for the active area is

E = (0.38 ton/acre/year) (8.16 acre) (7 months/12 months) (0.5 area active)
= 0.9 ton TSP /year which is 180 lb TSP/yr.

Emission factor for the inactive area is

E = (1-0.9)(0.38 ton/acre/year)(8.16 acre)(7 months/12 months)(0.5 area inactive)
= 0.09 ton TSP /year which is 18 lb TSP/yr.

Emission factor for the inactive period

E = (1-0.9)(0.38 ton/acre/year)(8.16 acre)(5 months/12 months)
= 0.13 ton TSP /year which is 260 lb TSP/yr.

Total from wind erosion is 0.9+0.09+0.13 = 1.12 tons TSP/year which is 2,240 lb TSP/yr.

The hourly emission rate is

(1.12 ton/yr)(1 yr/365 days)(1 day/24 hr)
= 1.28×10^{-4} ton TSP/hr which is 0.26 lb TSP/hr (annual average).

A.3 Total Landfill Emissions

Total combined emissions from dumping, bulldozing, and wind erosion are 0.095 + 1.26 + 1.12 = 2.48 tons TSP/year which is 4,950 lb TSP/yr.

A.4 Treatment Unit Reagent Storage and Handling

The treatment unit will use chemical reagents to chemically solidify and stabilize waste materials. Emissions from the treatment area will be controlled using HEPA filters and therefore are expected to have minimal particulate emissions. However, the handling and storage of the chemical reagents will be a source of emissions. The reagent handling process is essentially similar to the front end of a concrete batch plant. Emissions are estimated from factors for total PM provided in Table 11.12-2 of AP-42. For cement unloading to elevated storage silo and cement supplement unloading to elevated storage silo, total PM controlled emission factors of 0.00099 and 0.0089, respectively, are applied. Calculated emissions are for cement and cement supplement unloading to elevated storage silos, outside of the treatment area, and would not be HEPA filter controlled; however, emission controls such as a fabric filter will be used to control emissions from this equipment. The emission factors provided in the reference document are based on the use of a fabric filter or "sock" to control these emissions.

- The treatment unit will receive 36% (EDF-1547) of the 2,660 yd^3 (958 yd^3/yr) of waste requiring treatment (TFR-71, Section 1.7)

- Density of soil is 1,500 kg/m^3 (2,527 lb/yd^3)(EDF-ER-264, Table C-1)

- Waste loading is conservatively estimated as 65% (DOE-ID 2003b, Table 3-5). For 1 lb of soil, the following dry materials will be added:

  - 0.42 lb portland cement

  - 0.07 lb fly ash

- 0.042 lb blast furnace slag (BFS)
- 0.00055 lb Na_2S.

The annual quantity of soil processed in the treatment unit is

(958 yd^3/yr)(2,527 lb soil/yd^3) =2.42×10^6 lb soil/yr.

(2.42×10^6 lb soil/yr)(0.42 lb Portland cement/lb soil)(0.00099 emission factor)
= 1,007 lb Portland cement/year.

Emissions of the other materials are calculated in the same way, and are shown in Table A-1.

Table A-1. Emission rates for soil treatment additives.

Additive	Mass of Soil Processed (lb/yr)	Mass Ratio of Additive to Soil	Emission Factor	Controlled Emission Rate (lb/yr)
Portland Cement	2.42×10^6	0.42	0.00099	1007
Fly Ash	2.42×10^6	0.07	0.0089	1508
BFS	2.42×10^6	0.042	0.0089	905
Na_2S	2.42×10^6	0.00055	0.0089	12

Appendix B

WATER9 Modeling Input and Output Files

WATER9 Input Files

ICDF Landfill

UNIT CONCENTRATION SUMMARY 07-10-2002   12:27:04

Project C:\Program Files\Wastewater treatment models\ICDF Landfill FINAL 071002
The selected unit is 1 ICDF Landfill

COMPOUND NAME	Cin (PPMW)	Air fe	Removal fbio	Cout (ppmw)	
PROPANONE (acetone)	1.e+06	.0337	.003	9.6322e+	5
ACETONITRILE	1.e+06	.02577	.003	9.7113e+	5
PROPENAL (acrolein)	1620.	.06232	.003	1514.156	
ACRYLONITRILE	345.	.06763	.003	320.63	
ARAMITE	8610.	.03937	.003	8244.65	
BENZENE	870.	.3312	.002	579.723	
BENZIDINE	1690.	.	.003	1684.647	
BENZO(A)PYRENE	4430.	.00016	.006	4401.59	
BIS(2-CHLOROETHYL)ETHER	709.	.0009	.018	695.616	
BIS(2-CHLOROISOPROPYL)ETHER	2260.	.04259	.003	2156.823	
BIS(2-ETHYLHEXYL)PHTHALATE	1.e+06	.00064	.014	9.8499e+	5
CARBON DISULFIDE	3.0200e+	.49638	.002	1.5146e+	4
CHLOROBENZENE	6.81e+05	.25605	.003	5.0485e+	5
CHLOROETHANE (ethyl chloride)	1.e+06	.73253	.002	2.6593e+	5
CHLOROPHENOL-2	.	.00067	.015	.	
CHROMIUM (TOTAL) *	.	.47948	.002	.	
CRESOL	.	.00024	.008	.	
DI-n-OCTYL PHTHALATE	7980.	.31526	.002	5444.385	
DIBUTYLPHTHALATE	1.e+06	.00024	.008	9.9205e+	5
1,2 DICHLOROBENZENE (-o)	8.15e+05	.18242	.003	6.6407e+	5
1,4 DICHLOROBENZENE (-p)	9.73e+05	.23056	.003	7.4607e+	5
DICHLOROETHANE(1,1) ethylidenedich	291.e	.30568	.003	201.317	
DICHLOROETHANE(1,2)	474.	.17929	.003	387.7	
1,1 DICHLOROETHENE vinylidene chl	85.7	.55551	.002	37.928	
1,2 DICHLOROETHENE trans	1.e+06	.37227	.002	6.2537e+	5
DIMETHYL PHTHALATE	1.e+06	.00013	.006	9.943e+0	
4,6 DINITRO-o-CRESOL	.	.00016	.006	.	
1,4 DIOXANE	3.6000e+	.02121	.003	3.5125e+	4
ETHYLBENZENE	6.18e+05	.35104	.002	3.9957e+	5
CHLOROMETHANE (methylchloride)	1420.	.46218	.002	760.618	
2 BUTANONE (methyl ethyl ketone, M	1.e+06	.07326	.003	9.2375e+	5

NITROANILINE P	.	.05987	.003	.	
PCB AROCLOR 1016 (monochlorobiphen	.)	.03998	.003	.	
PCB AROCLOR 1254 (pentachlorobiphe	.l)	.04276	.003	.	
PCB AROCLOR 1260 (hexachlorobiphe	.l)	.04334	.003	.	
1,1,2 TRICHLOROETHANE	1100.	.12654	.003	957.637	
TRICHLOROETHANE 1,1,1 methyl chlor	1.e+06	.46192	.002	5.359e+0	
TRICHLOROPHENOL 2,4,6	1.69e+05	.00027	.008	1.6758e+	5
4 METHYL 2 PENTANONE (MIBK)	1.e+06	.09597	.003	9.0108e+	5
CYANIDE RADICAL (CN) *	4140.	.57967	.002	1732.404	
PCB AROCLOR 1268	.	.04643	.003	.	
ALUMINUM	.	.07935	.003	.	
ANTIMONY	.	.07935	.003	.	
ARSENIC	.	.07935	.003	.	
BARIUM	.	.07935	.003	.	
BERYLLIUM	.	.07935	.003	.	
CADMIUM	.	.07935	.003	.	
COBALT	.	.07935	.003	.	
COPPER	.	.07935	.003	.	
2 METHYL 1 PROPANOL (isobutanol)	1.e+06	.00088	.018	9.815e+0	
HEXACHLOROBENZENE	8.25	.58452	.002	3.4123	
HEXACHLOROBUTADIENE	366.	.33486	.002	242.548	
HEXACHLOROCYCLOPENTADIENE	569.	.08781	.003	517.347	
HEXACHLOROETHANE	9120.	.06539	.003	8496.198	
ISOPHORONE	1.e+06	.00049	.012	9.8751e+	5
MERCURY *	128.	.3835	.002	78.612	
MESITYL OXIDE	.	.02972	.003	.	
METHYL ETHANOATE (methyl acetate)	1.e+06	.05804	.003	9.3893e+	5
METHYLENE CHLORIDE, dichloromethan	2090.	.25117	.003	1559.583	
NAPHTHALENE	1.84e+05	.13633	.003	1.5839e+	5
NITROBENZENE	8.2600e+	.02257	.003	8.0479e+	4
OCTANE	.	.69931	.002	.	
PENTACHLOROPHENOL	6640.	.0368	.003	6375.238	
PHENOL	2.1300e+	.43559	.002	1.1974e+	4
2 PROPANOL (isopropanol)	1.e+06	.00081	.017	9.8248e+	5
TETRACHLOROETHENE	1.1900e+	.42326	.002	6836.313	
TOLUENE	5.34e+05	.34918	.002	3.4625e+	5
TRIBUTYLPHOSPHATE	.	.18311	.003	.	
TRICHLOROETHYLENE	3.42e+05	.3948	.002	2.0618e+	5
XYLENE	6.53e+05	.33276	.002	4.3411e+	5
MANGANESE	.	.07935	.003	.	
NICKEL	.	.07935	.003	.	

SILVER	.	.07935	.003	.	
THALLIUM	.	.07935	.003	.	
VANADIUM	.	.07935	.003	.	
ZINC	.	.07935	.003	.	
SULFURIC ACID	.	.07935	.003	.	
NITRIC ACID	.	.07935	.003	.	
PHOSPHORUS	.	.07935	.003	.	
SELENIUM	.	.07935	.003	.	
DIETHYL PHTHALATE	1.0900e+	.22898	.003	8375.038	
TETRACHLOROETHANE(1,1,2,2)	389.	.09785	.003	349.79	
TRICHLOROBENZENE 1,2,4	1.52e+05	.12114	.003	1.3315e+	5
ETHENYLBENZENE (styrene)	4.5500e+	.21814	.003	3.5452e+	4
2-HEXANONE	1.88e+05	.04466	.003	1.7903e+	5
DIACETONE ALCOHOL	1.e+06	.07276	.003	9.2425e+	5

TOTAL ALL COMPOUNDS 0.00E+00 g/s air emissions

ICDF Evaporation Pond

UNIT CONCENTRATION SUMMARY 07-10-2002 12:29:31

Project C:\Program Files\Wastewater treatment models\ICDF Evap Pond FINAL 071002
The selected unit is 1 ICDF Evap Pond

COMPOUND NAME	Cin (PPMW)	Air fe	Removal fbio	Cout (ppmw)	
PROPANONE (acetone)	1.e+06	.99968	.	321.686	
ACETONITRILE	1.e+06	.99964	.	363.29	
PROPENAL (acrolein)	1.4300e+	.99977	.	3.2432	
ACRYLONITRILE	5550.	.99979	.	1.1737	
ARAMITE	22.2	.99958	.	.00925	
BENZENE	4050.	.99978	.	.8893	
BENZIDINE	3780.	.004	.	3764.883	
BENZO(A)PYRENE	1.74	.99095	.	.01575	
BIS(2-CHLOROETHYL)ETHER	2840.	.99928	.	2.032	
BIS(2-CHLOROISOPROPYL)ETHER	1.0600e+	.99964	.	3.7776	
BIS(2-ETHYLHEXYL)PHTHALATE	26.5	.99894	.	.02815	
CARBON DISULFIDE	1.73e+05	.99978	.	38.39	
CHLOROBENZENE	1.e+06	.99976	.	244.617	
CHLOROETHANE (ethyl chloride)	1.e+06	.9998	.	202.06	
CHLOROPHENOL-2	.	.99904	.	.	
CHROMIUM (TOTAL) *	.	.99982	.	.	
CRESOL	.	.99464	.	.	
DI-n-OCTYL PHTHALATE	.0384	.9996	.	1.5244e-	5
DIBUTYLPHTHALATE	1.1800e+	.99562	.	51.63	
1,2 DICHLOROBENZENE (-o)	8.09e+05	.99974	.	212.265	
1,4 DICHLOROBENZENE (-p)	6.08e+05	.99974	.	158.766	
DICHLOROETHANE(1,1) ethylidenedich	1510.	.99978	.	.3254	
DICHLOROETHANE(1,2)	3060.	.99977	.	.6942	
1,1 DICHLOROETHENE vinylidene chl	385.	.99978	.	.08319	
1,2 DICHLOROETHENE trans	1.e+06	.9998	.	197.887	
DIMETHYL PHTHALATE	1.e+06	.98398	.	1.6019e+	4
4,6 DINITRO-o-CRESOL	.	.992	.	.	
1,4 DIOXANE	4.1e+05	.99941	.	240.151	
ETHYLBENZENE	1.e+06	.99974	.	262.201	
CHLOROMETHANE (methylchloride)	9630.	.9997	.	2.8482	
2 BUTANONE (methyl ethyl ketone, M	1.e+06	.99975	.	246.167	

NITROANILINE P	.	.99973	.	.	
PCB AROCLOR 1016 (monochlorobiphen	.)	.99967	.	.	
PCB AROCLOR 1254 (pentachlorobiphe	.l)	.99961	.	.	
PCB AROCLOR 1260 (hexachlorobiphe	.l)	.99964	.	.	
1,1,2 TRICHLOROETHANE	4430.	.99975	.	1.1	
TRICHLOROETHANE 1,1,1 methyl chlor	1.e+06	.99976	.	241.578	
TRICHLOROPHENOL 2,4,6	1.67e+05	.99682	.	531.572	
4 METHYL 2 PENTANONE (MIBK)	1.e+06	.99973	.	273.645	
CYANIDE RADICAL (CN) *	6.9000e+	.99984	.	10.969	
PCB AROCLOR 1268	.	.99961	.	.	
ALUMINUM	.	.99975	.	.	
ANTIMONY	.	.99975	.	.	
ARSENIC	.	.99975	.	.	
BARIUM	.	.99975	.	.	
BERYLLIUM	.	.99975	.	.	
CADMIUM	.	.99975	.	.	
COBALT	.	.99975	.	.	
COPPER	.	.99975	.	.	
2 METHYL 1 PROPANOL (isobutanol)	1.e+06	.99926	.	737.846	
HEXACHLOROBENZENE	.06	.99969	.	1.8876e-	5
HEXACHLOROBUTADIENE	2.73	.99969	.	.00084	
HEXACHLOROCYCLOPENTADIENE	1.14	.99971	.	.00033	
HEXACHLOROETHANE	2020.	.99971	.	.5919	
ISOPHORONE	1.e+06	.99849	.	1513.66	
MERCURY *	675.	.99989	.	.0721	
MESITYL OXIDE	.	.99963	.	.	
METHYL ETHANOATE (methyl acetate)	1.e+06	.99974	.	259.221	
METHYLENE CHLORIDE, dichloromethan	2.4600e+	.9998	.	4.9531	
NAPHTHALENE	3.6400e+	.99973	.	9.967	
NITROBENZENE	3.73e+05	.99953	.	175.348	
OCTANE	.	.99972	.	.	
PENTACHLOROPHENOL	4310.	.99962	.	1.6567	
PHENOL	1.61e+05	.99976	.	38.05	
2 PROPANOL (isopropanol)	1.e+06	.99918	.	817.716	
TETRACHLOROETHENE	1.6500e+	.99975	.	4.1798	
TOLUENE	1.e+06	.99975	.	245.75	
TRIBUTYLPHOSPHATE	.	.99966	.	.	
TRICHLOROETHYLENE	1.e+06	.99976	.	236.452	
XYLENE	1.e+06	.99977	.	232.697	
MANGANESE	.	.99975	.	.	
NICKEL	.	.99975	.	.	

SILVER	.	.99975	.	.
THALLIUM	.	.99975	.	.
VANADIUM	.	.99975	.	.
ZINC	.	.99975	.	.
SULFURIC ACID	.	.99975	.	.
NITRIC ACID	.	.99975	.	.
PHOSPHORUS	.	.99975	.	.
SELENIUM	.	.99975	.	.
DIETHYL PHTHALATE	1.4000e+	.9997	.	4.2132
TETRACHLOROETHANE(1,1,2,2)	1510.	.99973	.	.4088
TRICHLOROBENZENE 1,2,4	3.6000e+	.99974	.	9.274
ETHENYLBENZENE (styrene)	1.9400e+	.99974	.	5.0289
2-HEXANONE	1.e+06	.9997	.	304.163
DIACETONE ALCOHOL	1.e+06	.99973	.	268.638

TOTAL ALL COMPOUNDS 0.00E+00 g/s air emissions

WATER9 Output Files

ICDF Landfill

WASTEWATER TREATMENT SUMMARY 07-10-2002 11:46:16

Project C:\Program Files\Wastewater treatment models\ICDF Landfill FINAL 071002

COMPOUND	RATE	Fraction				
	(g/s)	Air	Removal	Exit	Adsorb	error
PROPANONE (acetone)	2.25E+02	.0337	.003	.9632	.	.
ACETONITRILE	1.72E+02	.02577	.003	.9711	.	.
PROPENAL (acrolein)	6.74E-01	.06232	.003	.9347	.	.
ACRYLONITRILE	1.56E-01	.06763	.003	.9294	.	.
ARAMITE	2.26E+00	.03937	.003	.9576	.	.
BENZENE	1.92E+00	.3312	.002	.6663	.	.
BENZIDINE	1.05E-05	.	.003	.9968	.	.
BENZO(A)PYRENE	4.85E-03	.00016	.006	.9936	.	.
BIS(2-CHLOROETHYL)ETHER	4.28E-03	.0009	.018	.9811	.	.
BIS(2-CHLOROISOPROPYL)ETHER	6.43E-01	.04259	.003	.9543	.	.
BIS(2-ETHYLHEXYL)PHTHALATE	4.29E+00	.00064	.014	.985	.	.
CARBON DISULFIDE	1.00E+02	.49638	.002	.5015	.	.
CHLOROBENZENE	1.16E+03	.25605	.003	.7413	.	.
CHLOROETHANE (ethyl chloride)	4.89E+03	.73253	.002	.2659	.	.
CHLOROPHENOL-2	0.00E+00	.	.	.	.	1.
CHROMIUM (TOTAL) *	0.00E+00	.	.	.	.	1.
CRESOL	0.00E+00	.	.	.	.	1.
DI-n-OCTYL PHTHALATE	1.68E+01	.31526	.002	.6823	.	.
DIBUTYLPHTHALATE	1.62E+00	.00024	.008	.992	.	.
1,2 DICHLOROBENZENE (-o)	9.93E+02	.18242	.003	.8148	.	.
1,4 DICHLOROBENZENE (-p)	1.50E+03	.23056	.003	.7668	.	.
DICHLOROETHANE(1,1) ethylidenedich	5.94E-01	.30568	.003	.6918	.	.
DICHLOROETHANE(1,2)	5.68E-01	.17929	.003	.8179	.	.
1,1 DICHLOROETHENE vinylidene chl	3.18E-01	.55551	.002	.4426	.	.
1,2 DICHLOROETHENE trans	2.49E+03	.37227	.002	.6254	.	.
DIMETHYL PHTHALATE	8.53E-01	.00013	.006	.9943	.	.
4,6 DINITRO-o-CRESOL	0.00E+00	.	.	.	.	1.
1,4 DIOXANE	5.10E+00	.02121	.003	.9757	.	.
ETHYLBENZENE	1.45E+03	.35104	.002	.6466	.	.
CHLOROMETHANE (methylchloride)	4.38E+00	.46218	.002	.5356	.	.
2 BUTANONE (methyl ethyl ketone, M	4.89E+02	.07326	.003	.9237	.	.
NITROANILINE P	0.00E+00	.	.	.	.	1.

PCB AROCLOR 1016 (monochlorobiphen	0.00E+00	.	.	.	.	1.
PCB AROCLOR 1254 (pentachlorobiphe	0.00E+00	.	.	.	.	1.
PCB AROCLOR 1260 (hexachlorobiphe	0.00E+00	.	.	.	.	1.
1,1,2 TRICHLOROETHANE	9.30E-01	.12654	.003	.8706	.	.
TRICHLOROETHANE 1,1,1 methyl chlor	3.09E+03	.46192	.002	.5359	.	.
TRICHLOROPHENOL 2,4,6	3.02E-01	.00027	.008	.9916	.	.
4 METHYL 2 PENTANONE (MIBK)	6.41E+02	.09597	.003	.9011	.	.
CYANIDE RADICAL (CN) *	1.60E+01	.57967	.002	.4185	.	.
PCB AROCLOR 1268	0.00E+00	.	.	.	.	1.
ALUMINUM	0.00E+00	.	.	.	.	1.
ANTIMONY	0.00E+00	.	.	.	.	1.
ARSENIC	0.00E+00	.	.	.	.	1.
BARIUM	0.00E+00	.	.	.	.	1.
BERYLLIUM	0.00E+00	.	.	.	.	1.
CADMIUM	0.00E+00	.	.	.	.	1.
COBALT	0.00E+00	.	.	.	.	1.
COPPER	0.00E+00	.	.	.	.	1.
2 METHYL 1 PROPANOL (isobutanol)	5.85E+00	.00088	.018	.9815	.	.
HEXACHLOROBENZENE	3.22E-02	.58452	.002	.4136	.	.
HEXACHLOROBUTADIENE	8.19E-01	.33486	.002	.6627	.	.
HEXACHLOROCYCLOPENTADIENE	3.34E-01	.08781	.003	.9092	.	.
HEXACHLOROETHANE	3.98E+00	.06539	.003	.9316	.	.
ISOPHORONE	3.28E+00	.00049	.012	.9875	.	.
MERCURY *	3.28E-01	.3835	.002	.6142	.	.
MESITYL OXIDE	0.00E+00	.	.	.	.	1.
METHYL ETHANOATE (methyl acetate)	3.88E+02	.05804	.003	.9389	.	.
METHYLENE CHLORIDE, dichloromethan	3.51E+00	.25117	.003	.7462	.	.
NAPHTHALENE	1.68E+02	.13633	.003	.8608	.	.
NITROBENZENE	1.25E+01	.02257	.003	.9743	.	.
OCTANE	0.00E+00	.	.	.	.	1.
PENTACHLOROPHENOL	1.63E+00	.0368	.003	.9601	.	.
PHENOL	6.20E+01	.43559	.002	.5622	.	.
2 PROPANOL (isopropanol)	5.39E+00	.00081	.017	.9825	.	.
TETRACHLOROETHENE	3.36E+01	.42326	.002	.5745	.	.
TOLUENE	1.25E+03	.34918	.002	.6484	.	.
TRIBUTYLPHOSPHATE	0.00E+00	.	.	.	.	1.
TRICHLOROETHYLENE	9.02E+02	.3948	.002	.6029	.	.
XYLENE	1.45E+03	.33276	.002	.6648	.	.
MANGANESE	0.00E+00	.	.	.	.	1.
NICKEL	0.00E+00	.	.	.	.	1.
SILVER	0.00E+00	.	.	.	.	1.

THALLIUM	0.00E+00	.	.	.	.	1.
VANADIUM	0.00E+00	.	.	.	.	1.
ZINC	0.00E+00	.	.	.	.	1.
SULFURIC ACID	0.00E+00	.	.	.	.	1.
NITRIC ACID	0.00E+00	.	.	.	.	1.
PHOSPHORUS	0.00E+00	.	.	.	.	1.
SELENIUM	0.00E+00	.	.	.	.	1.
DIETHYL PHTHALATE	1.67E+01	.22898	.003	.7684	.	.
TETRACHLOROETHANE(1,1,2,2)	2.54E-01	.09785	.003	.8992	.	.
TRICHLOROBENZENE 1,2,4	1.23E+02	.12114	.003	.876	.	.
ETHENYLBENZENE (styrene)	6.63E+01	.21814	.003	.7792	.	.
2-HEXANONE	5.61E+01	.04466	.003	.9523	.	.
DIACETONE ALCOHOL	4.86E+02	.07276	.003	.9242	.	.

TOTAL ALL COMPOUNDS 2.23E+04 g/s air emissions

ICDF Evaporation Pond

WASTEWATER TREATMENT SUMMARY 07-10-2002 11:48:39

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COMPOUND	RATE	Fraction				
	(g/s)	Air	Removal	Exit	Adsorb	error
PROPANONE (acetone)	1.70E+01	.99968	.	.0003	.	.
ACETONITRILE	1.70E+01	.99964	.	.0004	.	.
PROPENAL (acrolein)	2.43E-01	.99977	.	.0002	.	.
ACRYLONITRILE	9.43E-02	.99979	.	.0002	.	.
ARAMITE	3.77E-04	.99958	.	.0004	.	.
BENZENE	6.88E-02	.99978	.	.0002	.	.
BENZIDINE	2.57E-04	.004	.	.996	.	.
BENZO(A)PYRENE	2.93E-05	.99095	.	.0091	.	.
BIS(2-CHLOROETHYL)ETHER	4.82E-02	.99928	.	.0007	.	.
BIS(2-CHLOROISOPROPYL)ETHER	1.80E-01	.99964	.	.0004	.	.
BIS(2-ETHYLHEXYL)PHTHALATE	4.50E-04	.99894	.	.0011	.	.
CARBON DISULFIDE	2.94E+00	.99978	.	.0002	.	.
CHLOROBENZENE	1.70E+01	.99976	.	.0002	.	.
CHLOROETHANE (ethyl chloride)	1.70E+01	.9998	.	.0002	.	.
CHLOROPHENOL-2	0.00E+00	.	.	.	.	1.
CHROMIUM (TOTAL) *	0.00E+00	.	.	.	.	1.
CRESOL	0.00E+00	.	.	.	.	1.
DI-n-OCTYL PHTHALATE	6.53E-07	.9996	.	.0004	.	.
DIBUTYLPHTHALATE	2.00E-01	.99562	.	.0044	.	.
1,2 DICHLOROBENZENE (-o)	1.37E+01	.99974	.	.0003	.	.
1,4 DICHLOROBENZENE (-p)	1.03E+01	.99974	.	.0003	.	.
DICHLOROETHANE(1,1) ethylidenedich	2.57E-02	.99978	.	.0002	.	.
DICHLOROETHANE(1,2)	5.20E-02	.99977	.	.0002	.	.
1,1 DICHLOROETHENE vinylidene chl	6.54E-03	.99978	.	.0002	.	.
1,2 DICHLOROETHENE trans	1.70E+01	.9998	.	.0002	.	.
DIMETHYL PHTHALATE	1.67E+01	.98398	.	.016	.	.
4,6 DINITRO-o-CRESOL	0.00E+00	.	.	.	.	1.
1,4 DIOXANE	6.97E+00	.99941	.	.0006	.	.
ETHYLBENZENE	1.70E+01	.99974	.	.0003	.	.
CHLOROMETHANE (methylchloride)	1.64E-01	.9997	.	.0003	.	.
2 BUTANONE (methyl ethyl ketone, M	1.70E+01	.99975	.	.0002	.	.
NITROANILINE P	0.00E+00	.	.	.	.	1.

PCB AROCLOR 1016 (monochlorobiphen	0.00E+00	.	.	.	.	1.
PCB AROCLOR 1254 (pentachlorobiphe	0.00E+00	.	.	.	.	1.
PCB AROCLOR 1260 (hexachlorobiphe	0.00E+00	.	.	.	.	1.
1,1,2 TRICHLOROETHANE	7.53E-02	.99975	.	.0002	.	.
TRICHLOROETHANE 1,1,1 methyl chlor	1.70E+01	.99976	.	.0002	.	.
TRICHLOROPHENOL 2,4,6	2.83E+00	.99682	.	.0032	.	.
4 METHYL 2 PENTANONE (MIBK)	1.70E+01	.99973	.	.0003	.	.
CYANIDE RADICAL (CN) *	1.17E+00	.99984	.	.0002	.	.
PCB AROCLOR 1268	0.00E+00	.	.	.	.	1.
ALUMINUM	0.00E+00	.	.	.	.	1.
ANTIMONY	0.00E+00	.	.	.	.	1.
ARSENIC	0.00E+00	.	.	.	.	1.
BARIUM	0.00E+00	.	.	.	.	1.
BERYLLIUM	0.00E+00	.	.	.	.	1.
CADMIUM	0.00E+00	.	.	.	.	1.
COBALT	0.00E+00	.	.	.	.	1.
COPPER	0.00E+00	.	.	.	.	1.
2 METHYL 1 PROPANOL (isobutanol)	1.70E+01	.99926	.	.0007	.	.
HEXACHLOROBENZENE	1.02E-06	.99969	.	.0003	.	.
HEXACHLOROBUTADIENE	4.64E-05	.99969	.	.0003	.	.
HEXACHLOROCYCLOPENTADIENE	1.94E-05	.99971	.	.0003	.	.
HEXACHLOROETHANE	3.43E-02	.99971	.	.0003	.	.
ISOPHORONE	1.70E+01	.99849	.	.0015	.	.
MERCURY *	1.15E-02	.99989	.	.0001	.	.
MESITYL OXIDE	0.00E+00	.	.	.	.	1.
METHYL ETHANOATE (methyl acetate)	1.70E+01	.99974	.	.0003	.	.
METHYLENE CHLORIDE, dichloromethan	4.18E-01	.9998	.	.0002	.	.
NAPHTHALENE	6.19E-01	.99973	.	.0003	.	.
NITROBENZENE	6.34E+00	.99953	.	.0005	.	.
OCTANE	0.00E+00	.	.	.	.	1.
PENTACHLOROPHENOL	7.32E-02	.99962	.	.0004	.	.
PHENOL	2.74E+00	.99976	.	.0002	.	.
2 PROPANOL (isopropanol)	1.70E+01	.99918	.	.0008	.	.
TETRACHLOROETHENE	2.80E-01	.99975	.	.0003	.	.
TOLUENE	1.70E+01	.99975	.	.0002	.	.
TRIBUTYLPHOSPHATE	0.00E+00	.	.	.	.	1.
TRICHLOROETHYLENE	1.70E+01	.99976	.	.0002	.	.
XYLENE	1.70E+01	.99977	.	.0002	.	.
MANGANESE	0.00E+00	.	.	.	.	1.
NICKEL	0.00E+00	.	.	.	.	1.
SILVER	0.00E+00	.	.	.	.	1.

THALLIUM	0.00E+00	.	.	.	.	1.
VANADIUM	0.00E+00	.	.	.	.	1.
ZINC	0.00E+00	.	.	.	.	1.
SULFURIC ACID	0.00E+00	.	.	.	.	1.
NITRIC ACID	0.00E+00	.	.	.	.	1.
PHOSPHORUS	0.00E+00	.	.	.	.	1.
SELENIUM	0.00E+00	.	.	.	.	1.
DIETHYL PHTHALATE	2.38E-01	.9997	.	.0003	.	.
TETRACHLOROETHANE(1,1,2,2)	2.57E-02	.99973	.	.0003	.	.
TRICHLOROBENZENE 1,2,4	6.12E-01	.99974	.	.0003	.	.
ETHENYLBENZENE (styrene)	3.30E-01	.99974	.	.0003	.	.
2-HEXANONE	1.70E+01	.9997	.	.0003	.	.
DIACETONE ALCOHOL	1.70E+01	.99973	.	.0003	.	.

TOTAL ALL COMPOUNDS 3.73E+02 g/s air emissions

Appendix C

Tabulation of Modeling Results

Table C-1. Summary of ICDF landfill and evaporation pond operational limits—24-hour maximum.

				Particulate-Based[a]	WATER9 Volatilization-Based[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Guideline Concentrations[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based 24-Hr Concentration Guidelines		Mass Operational Limits—24-hr Maximum[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m³	(Annual) Acceptable Ambient Concentrations (AACC) µg/m³	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Noncarcinogens																				
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	9.55E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.57E + 01	2.00E + 01	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
1,2,4-Trichlorobenzene	120-82-1	1.85E + 00	Not Listed	No Value	9.15E + 04	2.18E + 04	9.15E + 04	2.18E + 04	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			9.15E + 04	2.18E + 04	1.34E + 05	3.22E + 01
1,2-Dichlorobenzene (-o)	95-50-1	1.50E + 01	Not Listed	No Value	4.91E + 05	4.87E + 05	4.91E + 05	4.87E + 05	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			4.91E + 05	4.87E + 05	7.18E + 05	7.21E + 02
1,2-Dichloroethene (total)	540-59-0	3.95E + 01	Not Listed	No Value	6.36E + 05	1.00E + 06	6.36E + 05	1.00E + 06	3.24E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.36E + 05	1.00E + 06	9.30E + 05	1.48E + 03
1,4-Dichlorobenzene (-p)	106-46-7	2.25E + 01	Not Listed	No Value	5.86E + 05	3.66E + 05	5.86E + 05	3.66E + 05	4.50E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			5.86E + 05	3.66E + 05	8.56E + 05	5.42E + 02
2-Butanone (methyl ethyl ketone, MEK)	78-93-3	2.95E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	2.47E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
2-Hexanone (methyl n-butyl ketone)	591-78-6	1.00E + 00	Not Listed	No Value	1.13E + 05	1.00E + 06	1.13E + 05	1.00E + 06	2.70E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.13E + 05	1.00E + 06	1.66E + 05	1.48E + 03
4,6 Dinitro-o-Cresol	534-52-1	1.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	4.46E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
4-Methyl-2-Pentanone (MIBK)	108-10-1	1.03E + 01	Not Listed	No Value	6.36E + 05	1.00E + 06	6.36E + 05	1.00E + 06	2.96E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.36E + 05	1.00E + 06	9.29E + 05	1.48E + 03
Acetone (propanone)	67-64-1	8.90E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Acetonitrile	75-05-8	3.35E + 00	Not Listed	No Value	7.54E + 05	1.00E + 06	7.54E + 05	1.00E + 06	1.16E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			7.54E + 05	1.00E + 06	1.10E + 06	1.48E + 03
Acrolein (propenal)	107-02-8	1.25E - 02	Not Listed	No Value	1.06E + 03	9.36E + 03	1.06E + 03	9.36E + 03	5.47E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.06E + 03	9.36E + 03	1.55E + 03	1.39E + 01
Aluminum	7429-90-5	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.60E + 05	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Antimony	7440-36-0	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	5.83E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Barium	7440-39-3	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.00E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Calcium (as calcium carbonate)	13765-19-0	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Carbon Disulfide	75-15-0	1.50E + 00	Not Listed	No Value	1.80E + 04	1.03E + 05	1.80E + 04	1.03E + 05	4.55E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.80E + 04	1.03E + 05	2.63E + 04	1.53E + 02
Chlorobenzene	108-90-7	1.75E + 01	Not Listed	No Value	4.07E + 05	6.57E + 05	4.07E + 05	6.57E + 05	6.57E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			4.07E + 05	6.57E + 05	5.95E + 05	9.72E + 02
Chloroethane (ethyl chloride)	75-00-3	1.32E + 02	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.47E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Chloromethane (methylchloride)	74-87-3	5.15E + 00	Not Listed	No Value	6.67E + 04	4.52E + 05	6.67E + 04	4.52E + 05	3.53E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.67E + 04	4.52E + 05	9.75E + 04	6.69E + 02

Table C-1 (continued)

				Particulate-Based[a]	WATER9 Volatilization-Based[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Guideline Concentrations[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based 24-Hr Concentration Guidelines		Mass Operational Limits—24-hr Maximum[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) µg/m^3	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Chlorophenol-2	95-57-8	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	1.83E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Chromium (total)	7440-47-3	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	4.12E + 04	5.00E + 05	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Cobalt	7440-48-4	2.50E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	1.10E + 02	5.00E + 05	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Copper	7440-50-8	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	2.99E + 04	5.00E + 05	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Cresol -o (2-methylphenol)	95-48-7	1.10E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	2.06E + 01	1.00E + 04	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Cresol -p (4-methylphenol)	106-44-5	1.10E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	3.86E + 01	1.00E + 04	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Cyclonite (RDX)	121-82-4	7.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	1.04E + 01	5.00E + 03	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Diacetone alcohol	123-42-2	1.20E + 01	Not Listed	No Value	1.00E + 06	+ 06	1.00E + 06	1.00E + 06	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled		NA			1.00E + 06	1.00E + 06	1.46E + 06	1 48E + 03
Dibutylphthalate	84-74-2	2.50E - 01	Not Listed	1.00E + 06	3.11E + 05	+ 03	3.11E + 05	3.67E + 03	2.39E + 01	1.00E + 04	WAC Controlled	Op. Controlled	2.39E + 01	1.00E + 04	WAC Controlled	WAC Controlled[k]	3.11E + 05	3.67E + 03	4.55E + 05	5.43E + 00
Diethylphthalate	84-66-2	2.50E - 01	Not Listed	No Value	6.52E + 03	+ 03	6.52E + 03	8.36E + 03	1.14E + 01	1.00E + 04	WAC Controlled	Op. Controlled	1.14E + 01	1.00E + 04	WAC Controlled	WAC Controlled[k]	6.52E + 03	8.36E + 03	9.53E + 03	1.24E + 01
Dimethylphthalate	131-11-3	2.50E - 01	Not Listed	1.00E + 06	1.93E + 05	+ 05	1.93E + 05	8.31E + 05	1.14E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.93E + 05	8.31E + 05	2.82E + 05	1.23E + 03
Di-n-octylphthalate	117-84-0	2.50E - 01	Not Listed	No Value	4.76E + 03	- 02	4.76E + 03	2.29E - 02	2.62E + 01	1.00E + 04	WAC Controlled	Op. Controlled	2.62E + 01	1.00E + 04	WAC Controlled	WAC Controlled[k]	4.76E + 03	2.29E - 02	6.96E + 03	3.39E - 05
Ethyl cyanide (as Cn - cyanide)	592-01-8	2.50E - 01	Not Listed	No Value	2.50E + 03	+ 04	2.50E + 03	4.17E + 04	3.31E + 04	1.00E + 04	Op. Controlled	WAC Controlled	--	NA			2.50E + 03	4.17E + 04	3.66E + 03	6.17E + 01
Ethylbenzene	100-41-4	2.18E + 01	Not Listed	No Value	3.70E + 05	+ 05	3.70E + 05	6.50E + 05	7.81E + 01	5.00E + 02	WAC Controlled	WAC Controlled		NA			3.70E + 05	6.50E + 05	5.42E + 05	9.62E + 02
Fluorides (as F)	7782-41-4	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	3.87E + 03	5.00E + 05	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Hexachlorocyclopentadiene	77-47-4	5.00E - 03	Not Listed	1.00E + 06	3.42E + 02	- 01	3.42E + 02	6.84E - 01	1.14E + 01	No limit	WAC Controlled	Op. Controlled	1 01	2.15E + 04	WAC Controlled	Evap Op Controlled[k]	3.42E + 02	6.84E - 01	5.00E + 02	1.01E - 03
Iron (as iron salts, soluable)	7439-89-6	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	2.40E + 05	5.00E + 05	WAC Controlled	WAC Controlled		NA			1.00E + 06	NA	1.46E + 06	NA
Isobutyl Alcohol (isobutanol; 2-methyl 1 propanol)	78-83-1	6.00E + 00	Not Listed	1.00E + 06	1.00E + 06	+ 06	1.00E + 06	1.00E + 06	1.16E + 00	1.00E + 04	WAC Controlled	WAC Controlled		NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Isophorone	78-59-1	1.40E + 00	Not Listed	1.00E + 06	7.99E + 05	1.00E + 06	7.99E + 05	1.00E + 06	1.14E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			7.99E + 05	1.00E + 06	1.17E + 06	1.48E + 03
Isopropyl Alcohol (2-propanol; isopropanol)	67-63-0	4.90E + 01	Not Listed	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03

Table C-1. (continued).

				Particulate-Based[a]	WATER9 Volatilization-Based[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Guideline Concentrations[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based 24-Hr Concentration Guidelines		Mass Operational Limits—24-hr Maximum[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) $\mu g/m^3$	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Manganese	7439-96-5	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.90E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Mercury	7439-97-6	5.00E - 03	Not Listed	No Value	7.74E + 01	4.07E + 02	7.74E + 01	4.07E + 02	9.45E + 03	5.00E + 05	Op. Controlled	Op. Controlled	--	NA			7.74E + 01	4.07E + 02	1.13E + 02	6.02E - 01
Mesityl Oxide	141-79-7	3.00E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Methyl Acetate (methyl ethanoate)	79-20-9	3.05E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	4.84E - 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	1.46E + 06	1.48E + 03
Molybdenum (as Mo soluable compounds)	7439-98-7	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.02E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Naphthalene	91-20-3	2.50E + 00	Not Listed	No Value	1.10E + 05	2.17E + 04	1.10E + 05	2.17E + 04	4.25E + 02	No limit	WAC Controlled	Op. Controlled	4.25E + 02	1.00E + 06	WAC Controlled	Evap Op Controlled[k]	1.10E + 05	2.17E + 04	1.61E + 05	3.21E + 01
Nitric Acid	7697-37-2	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	8.49E + 00	No limit	WAC Controlled		--	NA			1.00E + 06	NA	1.46E + 06	NA
Nitroaniline P	100-01-6	1.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.01E - 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Nitrobenzene	98-95-3	2.50E - 01	Not Listed	No Value	5.54E + 04	2.50E + 05	5.54E + 04	2.50E + 05	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			5.54E + 04	2.50E + 05	8.10E + 04	3.70E + 02
Pentachlorophenol	87-86-5	2.50E - 02	Not Listed	No Value	4.01E + 03	2.60E + 03	4.01E + 03	2.60E + 03	5.59E + 01	1.00E + 04	WAC Controlled	Op. Controlled	5.59E + 01	1.00E + 04	WAC Controlled	WAC Controlled[k]	4.01E + 03	2.60E + 03	5.86E + 03	3.85E + 00
Phenol	108-95-2	9.50E - 01	Not Listed	No Value	1.28E + 04	9.69E + 04	1.28E + 04	9.69E + 04	7.98E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.28E + 04	9.69E + 04	1.87E + 04	1.43E + 02
Phosphorus	7723-14-0	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Potassium (as potassium hydroxide)	1310-58-3	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.30E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Selenium	7782-49-2	1.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	8.46E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Silver	7440-22-4	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	9.84E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Sodium (as sodium hydroxide)	1310-73-2	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	3.20E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Styrene (ethenylbenzene)	100-42-5	1.00E + 00	Not Listed	No Value	2.74E + 04	1.17E + 04	2.74E + 04	1.17E + 04	6.11E - 02	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			2.74E + 04	1.17E + 04	4.01E + 04	1.73E + 01
Sulfuric Acid (as sulfate)	7664-93-9	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.31E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Sulfuric Acid (as sulfide)	7664-93-9	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.31E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Thallium	7440-28-0	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	4.30E + 00	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Toluene	108-88-3	1.88E + 01	Not Listed	No Value	3.21E + 05	7.82E + 05	3.21E + 05	7.82E + 05	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.21E + 05	7.82E + 05	4.69E + 05	1.16E + 03

Table C-1. (continued).

				Particulate-Based[a]	WATER9 Volatilization-Based[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Guideline Concentrations[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based 24-Hr Concentration Guidelines		Mass Operational Limits—24-hr Maximum[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) µg/m^3	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Tributylphosphate	126-73-8	1.10E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.80E + 02	1.10E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Trichloroethene	79-01-6	1.35E + 01	Not Listed	No Value	2.03E + 05	6.85E + 05	2.03E + 05	6.85E + 05	7.20E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			2.03E + 05	6.85E + 05	2.96E + 05	1.01E + 03
Vanadium	1314-62-1	2.50E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	4.50E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Xylene (total)	1330-20-7	2.18E + 01	Not Listed	No Value	3.92E + 05	7.12E + 05	3.92E + 05	7.12E + 05	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.92E + 05	7.12E + 05	5.73E + 05	1.05E + 03
Zinc	7440-66-6	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	2.08E + 05	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA
Zirconium (as Zr compounds)	7440-67-7	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	1.46E + 06	NA

Notes:

NA indicates that no emissions from water due to low volatility and no WAC limits have been set.

-- indicates that additional modeling was not required for this constituent.

Shaded values have evaporation pond concentrations below the WAC guideline concentrations. Subsequent modeling has shown that following WAC guidelines for both the landfill and evaporation pond with two cells will keep emissions within the IDAPA standards.

Underlined values have the landfill concentrations set at the WAC guideline concentrations. The evaporation pond concentrations have been maximized but are still below WAC guideline concentrations. Additional modeling may be performed to adjust landfill and evaporation pond concentrations including setting evaporation pond at WAC guidelines and maximizing landfill concentrations.

a. Based on particulate emission calculations for landfill operations; constituent concentration of particulates.

b. Based on volatilization emission calculations from WATER9 model. Landfill concentrations varied. Evaporation pond emissions based only on leachate from landfill. Landfill values increased until approximately 95% of IDAPA attained.

c. More restrictive of particulate-based and volatilization-based.

d. Evaporation pond concentration guidelines were not developed on a 24-hour basis.

e. Maximum amount of constituent that may be placed in the landfill/evaporation pond on an annual average basis. Typically based on a 12-month rolling average.

f. Taken from *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2002a).

g. Taken from *Waste Acceptance Criteria for ICDF Evaporation Pond* (DOE-ID 2002b).

h. Where the modeled concentration guideline is pure product (i.e., 1,000,000 mg/kg or 1 kg/kg) or greater than the WAC guidelines, the constituent is WAC controlled. Otherwise the constituent is operationally controlled.

i. Based on a maximum daily loading of 1,275 yd^3 per day and a density of 1,500 kg/m^3.

j. Based on an annual average daily leachate rate of 391 liters/day.

k. WAC guideline values selected for these constituents based on annual modeling and engineering judgment.

Table C-2. Summary of ICDF landfill and evaporation pond operational limits—annual.

Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) µg/m^3	Particulate-Based Limits[a]	WATER9 Volatilization-Based Limits[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Concentration Guidelines[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based Annual Concentration Guidelines		Mass Operational Limits—Annual Average[e]	
				Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Carcinogens																				
1,1-Dichloroethene (vinylidene chloride)	75-35-4	NA	2.00E - 02	No Value	8.57E + 01	3.85E + 02	8.57E + 01	3.85E + 02	1.48E + 00	5.00E + 02	WAC Controlled	Op. Controlled	1.48E + 00	2.01E + 04	WAC Controlled	WAC Controlled	8.57E + 01	3.85E + 02	4.94E + 01	5.70E - 01
1,1,2,2-Tetrachloroethane	79-34-5	NA	1.70E - 02	No Value	3.89E + 02	1.51E + 03	3.89E + 02	1.51E + 03	4.95E - 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.89E + 02	1.51E + 03	2.24E + 02	2.23E + 00
1,1,2-Trichloroethane	79-00-5	NA	6.20E - 02	No Value	1.10E + 03	4.43E + 03	1.10E + 03	4.43E + 03	2.42E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.10E + 03	4.43E + 03	6.32E + 02	6.55E + 00
1,1-Dichloroethane (ethylidenedichloride)	75-34-3	NA	3.80E - 02	No Value	2.91E + 02	1.51E + 03	2.91E + 02	1.51E + 03	2.34E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			2.91E + 02	1.51E + 03	1.68E + 02	2.24E + 00
1,2-Dichloroethane	107-06-2	NA	3.80E - 02	No Value	4.74E + 02	3.06E + 03	4.74E + 02	3.06E + 03	5.38E - 03	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			4.74E + 02	3.06E + 03	2.74E + 02	4.53E + 00
1,4-Dioxane	123-91-1	NA	7.10E - 01	No Value	3.60E + 04	4.10E + 05	3.60E + 04	4.10E + 05	1.88E - 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.60E + 04	4.10E + 05	2.08E + 04	6.07E + 02
Acrylonitrile	107-13-1	NA	1.50E - 02	No Value	3.45E + 02	5.55E + 03	3.45E + 02	5.55E + 03	5.83E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.45E + 02	5.55E + 03	1.99E + 02	8.22E + 00
Aramite	140-57-8	NA	1.40E - 01	1.00E + 06	8.61E + 03	2.22E + 02	8.61E + 03	2.22E + 02	6.71E + 00	1.00E + 04	WAC Controlled	Op. Controlled	6.71E + 00	1.43E + 05	WAC Controlled	WAC Controlled	8.61E + 03	2.22E + 02	4.97E + 03	3.28E - 01
Arsenic	7440-38-2	NA	2.30E - 04	2.59E + 04			2.59E + 04	No Value	5.80E + 01	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			2.59E + 04	NA	1.49E + 04	NA
Benzene	71-43-2	NA	1.20E - 01	No Value	8.70E + 02	4.05E + 03	8.70E + 02	4.05E + 03	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			8.70E + 02	4.05E + 03	5.02E + 02	5.99E + 00
Benzidine	92-87-5	NA	1.50E - 05	1.69E + 03	3.85E + 04	3.78E + 03	1.69E + 03	3.78E + 03	1.72E + 01	1.00E + 04	WAC Controlled	Op. Controlled	1.72E + 01	3.88E + 03	WAC Controlled	Evap Op Controlled	1.72E + 01	3.88E + 03	9.92E + 00	5.74E + 00
Benzo(a)pyrene	50-32-8	NA	3.00E - 04	3.38E + 04	4.43E + 03	1.74E + 00	4.43E + 03	1.74E + 00	1.05E + 02	2.00E + 03	WAC Controlled	Op. Controlled	1.05E + 02	3.11E + 02	WAC Controlled	Evap Op Controlled	1.05E + 02	3.11E + 02	6.06E + 01	4.60E - 01
Beryllium	440-41-7	NA	4.20E - 03	4.73E + 05			4.73E + 05	No Value	1.80E + 01	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			4.73E + 05	NA	2.73E + 05	NA
bis(2-Chloroethyl)ether	111-44-4	NA	3.00E - 03	3.38E + 05	7.09E + 02	2.84E + 03	7.09E + 02	2.84E + 03	1.14E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			7.09E + 02	2.84E + 03	4.09E + 02	4.20E + 00
bis(2-Chloroisopropyl)ether	108-60-1	NA	5.00E - 02	No Value	2.26E + 03	1.06E + 04	2.26E + 03	1.06E + 04	1.14E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			2.26E + 03	1.06E + 04	1.31E + 03	1.57E + 01
bis(2-Ethylhexyl)phthalate	117-81-7	NA	4.20E + 00	1.00E + 06	1.00E + 06	2.65E + 01	1.00E + 06	2.65E + 01	1.47E + 02	2.00E + 03	WAC Controlled	Op. Controlled	1.47E + 02	1.00E + 06	WAC Controlled	WAC Controlled	1.00E + 06	2.65E + 01	5.77E + 05	3.92E - 02
Cadmium	7440-43-9	NA	5.60E - 04	6.30E + 04			6.30E + 04	No Value	3.59E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			6.30E + 04	NA	3.64E + 04	NA
Chloromethane (methylchloride)	74-87-3	NA	2.80E - 01	No Value	1.42E + 03	9.63E + 03	1.42E + 03	9.63E + 03	3.53E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.42E + 03	9.63E + 03	8.21E + 02	1.42E + 01
Hexachlorobenzene	118-74-1	NA	2.00E - 03	No Value	8.25E + 00	6.00E - 02	8.25E + 00	6.00E - 02	1.14E + 01	No limit	Op. Controlled	Op. Controlled	--	NA			8.25E + 00	6.00E - 02	4.76E + 00	8.88E - 05
Hexachlorobutadiene	87-68-3	NA	5.00E - 02	No Value	3.66E + 02	2.73E + 00	3.66E + 02	2.73E + 00	2.07E + 01	No limit	WAC Controlled	Op. Controlled	2.07E + 01	4.86E + 04	WAC Controlled	Evap Op Controlled	2.07E + 01	4.86E + 04	1.19E + 01	7.19E + 01

Table C-2. (continued).

				Particulate-Based Limits[a]	WATER9 Volatilization-Based Limits[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Concentration Guidelines[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based Annual Concentration Guidelines		Mass Operational Limits—Annual Average[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) $\mu g/m^3$	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Hexachloroethane	67-72-1	NA	2.50E - 01	No Value	9.12E + 03	2.02E + 03	9.12E + 03	2.02E + 03	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			9.12E + 03	2.02E + 03	5.26E + 03	2.99E + 00
Methylene Chloride (dichloromethane)	75-09-2	NA	2.40E - 01	No Value	2.09E + 03	2.46E + 04	2.09E + 03	2.46E + 04	2.72E + 01	2.00E + 01	WAC Controlled	WAC Controlled	--	NA			2.09E + 03	2.46E + 04	1.21E + 03	3.64E + 01
Nickel	7440-02-0	NA	4.20E - 03	4.73E + 05			4.73E + 05	No Value	3.50E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			4.73E + 05	NA	2.73E + 05	NA
PCB Aroclor 1016 (monochlorobiphenyl)	NA	NA	1.00E - 02	1.00E + 06			1.00E + 06	No Value	7.69E + 00	0.00E + 00	WAC Controlled		--	NA			1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1254 (pentachlorobiphenyl)	NA	NA	1.00E - 02	1.00E + 06			1.00E + 06	No Value	1.28E + 02	0.00E + 00	WAC Controlled		--	NA			1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1260 (hexachlorobiphenyl)	NA	NA	1.00E - 02	1.00E + 06			1.00E + 06	No Value	5.00E + 02	0.00E + 00	WAC Controlled		--	NA			1.00E + 06	NA	5.77E + 05	NA
PCB Aroclor 1268	NA	NA	1.00E - 02	1.00E + 06			1.00E + 06	No Value	6.22E + 01	0.00E + 00	WAC Controlled		--	NA			1.00E + 06	NA	5.77E + 05	NA
Tetrachloroethene	127-18-4	NA	2.10E + 00	No Value	1.19E + 04	1.65E + 04	1.19E + 04	1.65E + 04	9.64E + 00	2.00E + 01	WAC Controlled	WAC Controlled	--	NA			1.19E + 04	1.65E + 04	6.86E + 03	2.43E + 01
Trichlorophenol 2,4,6	88-06-2	NA	1.80E - 01	1.00E + 06	1.69E + 05	1.67E + 05	1.69E + 05	1.67E + 05	1.83E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.69E + 05	1.67E + 05	9.77E + 04	2.47E + 02
Noncarcinogens																				
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	9.55E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.57E + 01	2.00E + 01	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
1,2,4-Trichlorobenzene	120-82-1	1.85E + 00	Not Listed	No Value	1.52E + 05	3.60E + 04	1.52E + 05	3.60E + 04	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.52E + 05	3.60E + 04	8.75E + 04	5.33E + 01
1,2-Dichlorobenzene (-o)	95-50-1	1.50E + 01	Not Listed	No Value	8.15E + 05	8.09E + 05	8.15E + 05	8.09E + 05	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			8.15E + 05	8.09E + 05	4.70E + 05	1.20E + 03
1,2-Dichloroethene (total)	540-59-0	3.95E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	3.24E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
1,4-Dichlorobenzene (-p)	106-46-7	2.25E + 01	Not Listed	No Value	9.73E + 05	6.08E + 05	9.73E + 05	6.08E + 05	4.50E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			9.73E + 05	6.08E + 05	5.62E + 05	9.00E + 02
2-Butanone (methyl ethyl ketone, MEK)	78-93-3	2.95E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	2.47E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
2-Hexanone (methyl n-butyl ketone)	591-78-6	1.00E + 00	Not Listed	No Value	1.88E + 05	1.00E + 06	1.88E + 05	1.00E + 06	2.70E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.88E + 05	1.00E + 06	1.08E + 05	1.48E + 03
4,6 Dinitro-o-Cresol	534-52-1	1.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	4.46E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
4-Methyl-2-Pentanone (MIBK)	108-10-1	1.03E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	2.96E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Acetone (propanone)	67-64-1	8.90E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Acetonitrile	75-05-8	3.35E + 00	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.16E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03

Table C-2. (continued).

Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) µg/m^3	Particulate-Based Limits[a]	WATER9 Volatilization-Based Limits[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Concentration Guidelines[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based Annual Concentration Guidelines		Mass Operational Limits—Annual Average[e]	
				Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Acrolein (propenal)	107-02-8	1.25E - 02	Not Listed	No Value	1.62E + 03	1.43E + 04	1.62E + 03	1.43E + 04	5.47E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.62E + 03	1.43E + 04	9.36E + 02	2.12E + 01
Aluminum	7429-90-5	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.60E + 05	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Antimony	7440-36-0	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	5.83E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Barium	7440-39-3	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.00E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Calcium (as calcium carbonate)	13765-19-0	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Carbon Disulfide	75-15-0	1.50E + 00	Not Listed	No Value	3.02E + 04	1.73E + 05	3.02E + 04	1.73E + 05	4.55E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.02E + 04	1.73E + 05	1.74E + 04	2.57E + 02
Chlorobenzene	108-90-7	1.75E + 01	Not Listed	No Value	6.81E + 05	1.00E + 06	6.81E + 05	1.00E + 06	6.57E + 00	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.81E + 05	1.00E + 06	3.93E + 05	1.48E + 03
Chloroethane (ethyl chloride)	75-00-3	1.32E + 02	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.47E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Chloromethane (methylchloride)	74-87-3	5.15E + 00	Not Listed	No Value	1.09E + 05	9.63E + 03	1.09E + 05	9.63E + 03	3.53E - 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			1.09E + 05	9.63E + 03	6.31E + 04	1.42E + 01
Chlorophenol-2	95-57-8	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	1.83E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Chromium (total)	7440-47-3	2.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	4.12E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Cobalt	7440-48-4	2.50E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	1.10E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Copper	7440-50-8	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	2.99E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Cresol -o (2-methylphenol)	95-48-7	1.10E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	2.06E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Cresol -p (4-methylphenol)	106-44-5	1.10E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	3.86E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Cyclonite (RDX)	121-82-4	7.50E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	1.04E + 01	5.00E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Diacetone alcohol	123-42-2	1.20E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Dibutylphthalate	84-74-2	2.50E - 01	Not Listed	1.00E + 06	1.00E + 06	1.18E + 04	1.00E + 06	1.18E + 04	2.39E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.18E + 04	5.77E + 05	1.75E + 01
Diethylphthalate	84-66-2	2.50E - 01	Not Listed	No Value	1.09E + 04	1.40E + 04	1.09E + 04	1.40E + 04	1.14E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.09E + 04	1.40E + 04	6.27E + 03	2.07E + 01
Dimethylphthalate	131-11-3	2.50E - 01	Not Listed	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.14E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Di-n-octylphthalate	117-84-0	2.50E - 01	Not Listed	No Value	7.98E + 03	3.84E - 02	7.98E + 03	3.84E - 02	2.62E + 01	1.00E + 04	WAC Controlled	Op. Controlled	2.62E + 01	1.00E + 06	WAC Controlled	WAC Controlled	7.98E + 03	3.84E - 02	4.60E + 03	5.68E - 05

Table C-2. (continued).

Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m^3	(Annual) Acceptable Ambient Concentrations (AACC) µg/m^3	Particulate-Based Limits[a] Conc. in Landfill (mg/kg)	WATER9 Volatilization-Based Limits[b] Conc. in Landfill (mg/kg)	WATER9 Volatilization-Based Limits[b] Conc. in Evaporation Pond (mg/L)	Modeled Concentration Guidelines[c] Conc. in Landfill (mg/kg)	Modeled Concentration Guidelines[c] Conc. in Evaporation Pond (mg/L)	WAC Guidelines: WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines: WAC Guidelines for Evaporation Pond[g] (mg/L)	Comparison of Modeled Guidelines to WAC Guidelines: Landfill[h]	Comparison of Modeled Guidelines to WAC Guidelines: Evaporation Pond[h]	Evaporation Pond Concentration Guidelines[d]: WAC Guidelines for Landfill (mg/kg)	Evaporation Pond Concentration Guidelines[d]: Conc. in Evaporation Pond (mg/L)	Comparison of Evap Pond Guidelines to WAC Guidelines: Landfill	Comparison of Evap Pond Guidelines to WAC Guidelines: Evaporation Pond	Emission Based Annual Concentration Guidelines: Landfill (mg/kg)	Emission Based Annual Concentration Guidelines: Evaporation Pond (mg/L)	Mass Operational Limits—Annual Average[e]: Landfill[i] (kg/day)	Mass Operational Limits—Annual Average[e]: Evaporation Pond[j] (kg/day)
Ethyl cyanide (as Cn - cyanide)	592-01-8	2.50E - 01	Not Listed	No Value	4.14E + 03	6.90E + 04	4.14E + 03	6.90E + 04	3.31E + 04	1.00E + 04	Op. Controlled	WAC Controlled	--	NA			4.14E + 03	6.90E + 04	2.39E + 03	1.02E + 02
Ethylbenzene	100-41-4	2.18E + 01	Not Listed	No Value	6.18E + 05	1.00E + 06	6.18E + 05	1.00E + 06	7.81E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.18E + 05	1.00E + 06	3.56E + 05	1.48E + 03
Fluorides (as F)	7782-41-4	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	3.87E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Hexachlorocyclopentadiene	77-47-4	5.00E - 03	Not Listed	1.00E + 06	5.69E + 02	1.14E + 00	5.69E + 02	1.14E + 00	1.14E + 01	No limit	WAC Controlled	Op. Controlled	1.14E + 01	2.15E + 04	WAC Controlled	Evap Op Controlled	1.14E + 01	2.15E + 04	6.58E + 00	3.18E + 01
Iron (as iron salts, soluable)	7439-89-6	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	2.40E + 05	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Isobutyl Alcohol (isobutanol; 2-methyl 1-propanol)	78-83-1	6.00E + 00	Not Listed	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.16E + 00	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Isophorone	78-59-1	1.40E + 00	Not Listed	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.14E + 01	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Isopropyl Alcohol (2-propanol; isopropanol)	67-63-0	4.90E + 01	Not Listed	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Manganese	7439-96-5	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.90E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Mercury	7439-97-6	5.00E - 03	Not Listed	No Value	1.28E + 02	6.75E + 02	1.28E + 02	6.75E + 02	9.45E + 03	5.00E + 05	Op. Controlled	Op. Controlled	--	NA			1.28E + 02	6.75E + 02	7.40E + 01	9.99E - 01
Mesityl Oxide	141-79-7	3.00E + 00	Not Listed	1.00E + 06			1.00E + 06	No Value	1.00E + 05	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Methyl Acetate (methyl ethanoate)	79-20-9	3.05E + 01	Not Listed	No Value	1.00E + 06	1.00E + 06	1.00E + 06	1.00E + 06	4.84E - 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	1.00E + 06	5.77E + 05	1.48E + 03
Molybdenum (as Mo soluable compounds)	7439-98-7	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.02E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Naphthalene	91-20-3	2.50E + 00	Not Listed	No Value	1.84E + 05	3.64E + 04	1.84E + 05	3.64E + 04	4.25E + 02	No limit	WAC Controlled	Op. Controlled	4.25E + 02	1.00E + 06	WAC Controlled	Evap Op Controlled	4.25E + 02	1.00E + 06	2.45E + 02	1.48E + 03
Nitric Acid	7697-37-2	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	8.49E + 00	No limit	WAC Controlled		--	NA			1.00E + 06	NA	5.77E + 05	NA
Nitroaniline P	100-01-6	1.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	1.01E - 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Nitrobenzene	98-95-3	2.50E - 01	Not Listed	No Value	8.26E + 04	3.73E + 05	8.26E + 04	3.73E + 05	1.14E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			8.26E + 04	3.73E + 05	4.76E + 04	5.52E + 02
Pentachlorophenol	87-86-5	2.50E - 02	Not Listed	No Value	6.64E + 03	4.31E + 03	6.64E + 03	4.31E + 03	5.59E + 01	1.00E + 04	WAC Controlled	Op. Controlled	5.59E + 01	1.08E + 05	WAC Controlled	WAC Controlled	6.64E + 03	4.31E + 03	3.83E + 03	6.38E + 00
Phenol	108-95-2	9.50E - 01	Not Listed	No Value	2.13E + 04	1.61E + 05	2.13E + 04	1.61E + 05	7.98E + 01	1.00E + 04	WAC Controlled	WAC Controlled	--	NA			2.13E + 04	1.61E + 05	1.23E + 04	2.39E + 02
Phosphorus	7723-14-0	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA

Table C-2. (continued).

				Particulate-Based Limits[a]	WATER9 Volatilization-Based Limits[b]		Modeled Concentration Guidelines[c]		WAC Guidelines		Comparison of Modeled Guidelines to WAC Guidelines		Evaporation Pond Concentration Guidelines[d]		Comparison of Evap Pond Guidelines to WAC Guidelines		Emission Based Annual Concentration Guidelines		Mass Operational Limits—Annual Average[e]	
Compound	CAS No.	(24 Hour) Acceptable Ambient Concentrations (AAC) mg/m³	(Annual) Acceptable Ambient Concentrations (AACC) µg/m³	Conc. in Landfill (mg/kg)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Conc. in Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	WAC Guidelines for Landfill[f] (mg/kg)	WAC Guidelines for Evaporation Pond[g] (mg/L)	Landfill[h]	Evaporation Pond[h]	WAC Guidelines for Landfill (mg/kg)	Conc. in Evaporation Pond (mg/L)	Landfill	Evaporation Pond	Landfill (mg/kg)	Evaporation Pond (mg/L)	Landfill[i] (kg/day)	Evaporation Pond[j] (kg/day)
Potassium (as potassium hydroxide)	1310-58-3	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.30E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Selenium	7782-49-2	1.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	8.46E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Silver	7440-22-4	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	9.84E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Sodium (as sodium hydroxide)	1310-73-2	1.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	3.20E + 03	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Styrene (ethenylbenzene)	100-42-5	1.00E + 00	Not Listed	No Value	4.55E + 04	1.94E + 04	4.55E + 04	1.94E + 04	6.11E - 02	2.00E + 03	WAC Controlled	WAC Controlled	--	NA			4.55E + 04	1.94E + 04	2.62E + 04	2.88E + 01
Sulfuric Acid (as sulfate)	7664-93-9	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.31E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Sulfuric Acid (as sulfide)	7664-93-9	5.00E - 02	Not Listed	1.00E + 06			1.00E + 06	No Value	3.31E + 04	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Thallium	7440-28-0	5.00E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	4.30E + 00	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Toluene	108-88-3	1.88E + 01	Not Listed	No Value	5.34E + 05	1.00E + 06	5.34E + 05	1.00E + 06	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			5.34E + 05	1.00E + 06	3.08E + 05	1.48E + 03
Tributylphosphate	126-73-8	1.10E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	4.80E + 02	1.10E + 03	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Trichloroethene	79-01-6	1.35E + 01	Not Listed	No Value	3.42E + 05	1.00E + 06	3.42E + 05	1.00E + 06	7.20E + 01	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			3.42E + 05	1.00E + 06	1.97E + 05	1.48E + 03
Vanadium	1314-62-1	2.50E - 03	Not Listed	1.00E + 06			1.00E + 06	No Value	4.50E + 02	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Xylene (total)	1330-20-7	2.18E + 01	Not Listed	No Value	6.53E + 05	1.00E + 06	6.53E + 05	1.00E + 06	5.00E + 02	5.00E + 02	WAC Controlled	WAC Controlled	--	NA			6.53E + 05	1.00E + 06	3.77E + 05	1.48E + 03
Zinc	7440-66-6	5.00E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	2.08E + 05	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA
Zirconium (as Zr compounds)	7440-67-7	2.50E - 01	Not Listed	1.00E + 06			1.00E + 06	No Value	No Limit	5.00E + 05	WAC Controlled	WAC Controlled	--	NA			1.00E + 06	NA	5.77E + 05	NA

Notes:

a. Based on particulate emission calculations for landfill operations; constituent concentration of particulates.

b. Based on volatilization emission calculations from WATER9 model. Landfill concentrations varied. Evaporation pond emissions based only on leachate from landfill. Landfill values increased until approximately 95% of IDAPA attained.

c. More restrictive of particulate-based and volatilization-based.

d. Evaporation Pond operational limits for specific constituents. Using WAC guidelines for landfill, the evaporation pond concentration was increased until approximately 95% of IDAPA standard attained.

e. Maximum amount of constituent that may be placed in the landfill/evaporation pond on an annual average basis. Typically based on a 12-month rolling average.

f. Taken from *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2002a).

g. Taken from *Waste Acceptance Criteria for ICDF Evaporation Pond* (DOE-ID 2002b).

h. Where the modeled concentration guideline is pure product (i.e., 1,000,000 mg/kg or 1 kg/kg) or greater than the WAC guidelines, the constituent is WAC controlled. Otherwise the constituent is operationally controlled.

i. Based on an annual average loading of 503 yd³ per day and a density of 1,500 kg/m³.

j. Based on an annual average daily leachate rate of 391 liters/day.